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THE ORIGINE OF FORMES and QUALITIES,

12.7.B.20

(According to the *Corpuſcular Philoſophy*,) Illuſtrated by *Conſiderations* and EXPERIMENTS,

(Written formerly by way of *Notes* upon an *Eſſay* about NITRE)

BIBLIOTECA NAZ. ROMA VITTORIO EMANUELE

Bibl. S. Pantaleonis Scholarum Piarum

By the Honourable

ROBERT BOYLE,

Fellow of the *Royal Society*.

Audendum eſt, & Veritas inveſtiganda; quam etiamſi non aſſequamur, omnino tamen propiùs, quàm nunc ſumus, ad eam perveniemus. Galen.

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ROBERTUS SAY,

VICECANCELLARIUS

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The Publiſher to the Ingenious Reader.

I*N this curious and inquiſitive Age, when men, altogether diſſatisfied and wearied out with the wranglings and idle ſpeculations of the Schools, are with equal zeal and induſtry ſo earneſt in their queſt and purſuit of a more ſolid, rational, and uſeful* Philoſophy, *it may prove a work very obliging and meritorious to help and guide them in their ſtudies and reſearches, and to hang out a Light to them, (as the Ægyptians uſed to do from their highly celebrated* Pharos, *for direction to the Mariners, that ſailed in thoſe dangerous Seas neer* Alexandria.) *whereby they may, with better ſucceſs, ſteer their courſe through the vaſt* Ocean *of Learning, and make more full and perfect Diſcoveries of hitherto unknown* Philoſophical verities: *which has been the chief Deſign of this* Gentleman *of* Honour, *the moſt* excellent *and* Incomparable Author *in this* Treatiſe *now preſented to your view, wherein Principles are not (as was the mode and guize of former times) obtruded on the World upon the account of a Great Name, or involved in cloudy and myſtical Notions, which put the Underſtanding upon the Wrack, and yet when* *with all this labour and toile of the Brain they are at laſt known, prove impertinent and uſeleſſe to the making out with ſatisfaction, or ſo much as tolerably, the ordinary* Phænomena, *which* Nature *every day preſents the world with, but ſuch as are built upon the firme and immoveable foundation of Reaſon, Senſe, and Experience, plain and obvious as well to the Eye as the Underſtanding, and no leſs accurate and certain in their Application. And though the moſt* noble Author *hath herein, for the main, eſpouſed the* Atomical Philoſophy *(corrected and purged from the wild fancies and extravagancies of the firſt* Inventours *of it, as to the* Origine *of the* Univerſe, *and ſtill imbraced with ſo much kindneſs and tenderneſs by ſome* Pretenders, *againſt which He hath ſo Learnedly diſputed in his firſt part* Of the Uſefulneſs of Experimental Philoſophy, p. 74.*&c.) in explicating the Appearances; yet conſidering the ſeveral Alterations and Additions (the happy product of his penetrating judgment) made therein, I may not ſcruple to call it a New* Hypotheſis, *peculiar to the* Author, *made out by daily Obſervations, familiar Proofs and Experiments, and by exact and eaſily practicable* Chymical proceſſes. *whereby one of the moſt abſtruſeſt parts of* Natural Philoſophy, *the* Origine of

Forms and Qualities, *which ſo much vexed and puzzled the* Antients, *and which, I would ſpeak with the leave of the* Carteſians, *their* Ingenious Maſter *durſt ſcarce venture upon, or at leaſt was unwilling to handle at large, is now fully cleared, and become manifeſt: ſo that from this very* Eſſay *we may well take hope, and joyfully expect to ſee the noble* Project *of the famous* VERULAM *(hitherto reckond among the* Deſiderata*) receive its full and perfect Accompliſhment, I mean, a real, uſeful, and experimental* Phyſiology *eſtabliſhed and bottomed upon eaſie, true, and generally received* Principles. *But I ſhall not foreſtall thy judgment either about the Excellency of the Author, or his Subject, who hath ſo freely communicated to the World thoſe* treaſures *of* Learning, *wherewith his Mind is enriched, but ſhall ſoon refer you to the* Work *it ſelf, after I have given you theſe few Advertiſements.*

The following Diſcourſe (as is eaſily perceivable by divers Paſſages thereof) being written, ſeveral years ſince, whole and entire, as now it is, I know not whether it will be worth while to intimate, that the Author, *caſually turning over of late a very recent* Chymical Writer, *found in one of his Treatiſes (divers of which he never to this day read over) a part of the* Fifth Experiment *of the ſecond* *Section*; *but, as He profeſſes, (and ſure is like to be believed,) he did not dream that That* Chymiſt, *or any other Author whatſoever had lighted on that part of the* Experiment *till a good while after he had made and examined That, among many others, concerning* Salts, *as may be eaſily gueſs'd by the peculiar uſes and applications He made of it. And though He had met with ſo unlikely an Experiment in a Writer, who, whether he deſerve it or no, has the ill fortune to be much accuſ'd of Inſincerity, and ſome of whoſe more eaſie proceſſes our Author (who yet is willing to ſpare his Name, and ſeems to think his works not uſeleſs) could not find to ſucceed, He ſhould not have taken it upon his* Authority, *no more then he is wont to take other* Proceſſes, *divers of which He yet in the general ſuppoſes may be true upon the relation of other Chymiſts; who by blemiſhing their Books by things untrue and juſtly ſuſpicious, are not to be relyed on, nor much thanked by wary men. But twill probably appear leſſe pertinent to adde any thing further on this ſubject, then to take notice, that when the* Author *had once conſented to the Publication of the following* Papers, *He ſeveral times wiſhd for an Opportunity to make the* Experiments *and* Obſervations, *He now preſents to the* Publick,

more

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more full and compleat, then they were when addreſs'd to a private Friend. *But the* Contagion, *that drove him from the Places, where his Accommodations for repeating Experiments were, oblig'd Him to apply Himſelf to other* Studies *and* Employments.

And upon the ſame account, though he afterwards found many of his Notes *upon other parts of the Eſſay of* Salt-petre, *and have lying by him divers* Papers *concerning* Senſible Qualities, *and* Senſation in general, *and the* Production of Second Qualities, *together with a collection of* Notes about Occult Qualities, *and ſome other Subjects of kin to thoſe of this* Book; *yet having, upon the freſhly intimated Occaſion, diverted his Thoughts to other Subjects, He will not engage himſelf to put together and communicate his Collections on theſe Subjects by any Publick promiſe.*

Onely thus much perchance I may undertake for, if a fair Opportunity offer it ſelf, that the Author may be induc'd to adde ere long, for the completion of this preſent Work, a Diſcourſe of Subordinate Forms, *wherein He, not finding that they have been by any one attempted to be explicated by the* Corpuſcularian Hypotheſis, *hath propoſed an Account of them agreeable thereunto.*

Furthermore, as the Author *has in the follow-*

ing Diſquiſitions aim'd not at the raiſing or abetting a Faction in Philoſophy, but at the Diſcovery of the Truth; ſo he is not ſo ſollicitous what every ſort of Reader will think of his Attempts, (which tis eaſie to foreſee are not like to be overwelcome to the Votaries of the School Philoſophy) *as to refuſe a Compliance with the deſires of his Friends, who have been long ſince very earneſt with him not to ſpend that time in* Replies *to particular Perſons, which might be more uſefully imploy'd in purſuing further Diſcoveries of Nature by* Experiments. *If he meet with any cogent and material Objections againſt any of his chief Opinions, He is enough a Lover of Truth, to be diſpoſ'd to think himſelf oblig'd by thoſe that ſhall ſhew him his Miſtakes, and to take occaſion to reforme them. But if nothing* new *or* weighty *be urg'd, He conſiders, that he lives in an Age, wherein he has obſerv'd (even in his Own caſe) that Truths, if recommended by real Experiments, will in time make their own way, and wherein live ſtore of Ingenious Men, who, for the main, approve the Opinions, and probably will not diſlike the Arguments he has propoſ'd, and who being more at leiſure then He to write Polemical Books, will not ſilently ſuffer what they judge Truth, to be triumph'd over, or oppreſſd by thoſe, who, imploying uſually but*

Scholaſtical Arguments, may be confuted by Anſwers of the like nature. And therefore He doubts not, but that ſome Learned Favourers of the Corpuſcularian *Philoſophy* (*of which he hath endeavour'd to make out thoſe parts, wherein they almoſt all agree*) *will be both able and willing to defend thoſe Diſcoveries by rational Diſputations, that they have not Opportunity to increaſe by New Experiments.*

In the mean while I have no Temptation to doubt in the leaſt, but that this curious and excellent Piece will be entertained and received by all that have any regard to the great concerns of Learning with that guſt, delight, reſpect, and æſtimation which it ſo highly merits.

* * *

The following Treatiſe being printed in the abſence of the Honourable *Author, there has happned* (*through the miſplacing of the ſeveral Bundles writ apart fairly for the Preſs*) *a Diſlocation at the* 107. *page,* (*as is there alſo intimated*) *where the firſt Section of the* Hiſtorical *part is placed, which ſhould not have come in till p.* 169. *after the diſcourſe of* F O R M S.

* * *

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*The Proœmial Diſcourſe to the Reader.**

AS tis the part of a Mineraliſt both to *diſcover* new Mines,and to *work* thoſe that are already diſcovered, by ſeparating & melting the Oares, to reduce them into perfect Metals; ſo I eſteem,that it becomes a Naturaliſt,not onely to *deviſe* Hypotheſes & Experiments,but to examine and *Improve* thoſe that are already found out.Upon this conſideration (among other Motives) I was invited to make the following Attempt, whoſe productions coming to be expoſ'd to other Eyes, then thoſe for which they were firſt written, twill be requiſite to give the publick ſome Account of the Occaſion, the Scope, and ſome Circumſtances. And this I ſhall do the more fully, becauſe the reaſons I am to render of my way of writing in reference to the *Peripatetick* Philoſophy, muſt contain Intimations,which perhaps will not be uſeleſs to ſome ſorts of Readers, (eſpecially Gentlemen,) and by being apply'd to moſt of thoſe other parts of my Writings, that relate to the School Philoſophy, may do Them good ſervice, and ſave both my Readers and me ſome trouble of Repetitions.

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* The following *Preface* being addreſsd onely to *Pyrophilus*.

Having four or five years ago publiſhd a little *P*hyſico-Chymical Tract about the differing parts and redintegration of Nitre, I found as well by other ſignes as by the Early ſollicitations of the Stationer for a new Edition, that I had no *c*auſe to complain of the Reception that had been given it: But I obſerved too, that the Diſcourſe, conſiſting chiefly of Reflexions, that were occaſionally made upon the *Phænomena* of a ſingle Experiment,was more available to confirme thoſe in the Corpuſcularian *P*hiloſophy, that had already ſomewhat inquir'd into it, then to acquaint thoſe with the principles and notions of it, who were utter Strangers to it; and as to many Reader*s* , was fitter to excite a Curioſity for that Philoſophy,then to give an Introduction thereunto. Upon this Occaſion it came into my mind, that about the time when I writ that Eſſay about Salt-petre, (which was divers years before twas publiſhed) I had alſo ſome thoughts of a Hiſtory of Qualities, and that having in looſe Sheets ſet down divers Obſervations and Experiments proper for ſuch a Deſign, I had alſo drawn up *a* Diſcourſe, which was ſo contriv'd, that though ſome parts of it were written in ſuch a manner, as that they may ſerve for Expoſitory Notes upon ſome particular paſſages of the Eſſay; yet thoſe parts with the reſt might ſerve for a *General Preface* to the Hiſtory of Qualities, in caſe I ſhould ever have Conveniency as well as Inclination to make the proſecuting of It my Buſineſs; and in the mean time might preſent That *Pyrophilus*, to whom I writ, ſome kind of Introduction to the principles of the Mechanical *P*hiloſophy, by expounding to him, as far as my Thoughts and Experiments would enable me to do, in few words, what, according to the Corpuſcularian Notions, may be thought of the Nature and Origine of Qualities and Forms; the knowledge of which either makes or ſuppoſes the moſt fundamental and uſeful part of Natural *P*hiloſophy. And to invite me to make uſe of theſe Conſiderations and Tryals about Qualities and Formes, it opportunely happen'd, that though I could not find many of the Notes written about particular Qualities, (my looſe papers having been, during the late Confuſions, much ſcatter'd by the many Removes I had then occaſion to make,) yet when laſt Winter, being urged to publiſh my Hiſtory of Gold, (which ſoon after came forth,) I rumag'd among my Looſe papers, *I* found, that the ſeveral Notes of mine that he had met with under various heads, but yet all concerning the Origine of Forms and Qualities, together with the *Preface* addreſs'd to *Pyrophilus*, (though written at diſtant times and places) had two or three years before, by the care of an Induſtrious perſon, with whom *I* left them, been fairly copied out together, (which circumſtance *I* mention, that the Reader may not wonder to find the following Book not written uniformly in one continued tenor,) excepting ſome Experiments, which having been of my own making, 'twas not difficult for me to perfect, either out of my Notes and memory, or (where *I* doubted their ſufficiency) by repeated Tryals. So that if the Urgency, wherewith divers Ingenious Men preſs'd the publication of my new Experiments about Gold, and my unwillingneſs to protract it, till the Froſty ſeaſon, that was fitteſt to examine and prove them, were all paſs'd, had not prevail'd with me to let thoſe Obſervations be made publick the laſt VVinter, they might have been Accompanied with the preſent Eſſay of the *Origine of Qualities and Formes*, which may be premiſ'd to what *I* have written touching Any of the particular Qualities,ſince it containes Experiments and Conſiderations fit to be præliminary to them all.

But though *I* was by this meanes diverted from putting out the following Treatiſe at the ſame time with the Hiſtory of Gold, yet *I* was without much difficulty prevail'd with not to alter my intentions of ſuffering it to come abroad; becauſe divers of my Hiſtorical Accounts of ſome particular Qualities are to be reprinted, which may receive much Light and Confirmation by the things deliver'd in this preſent Treatiſe about Qualities and Forms in general. To which Inducement was added the Perſwaſion of ſome ingenious Perſons,who are pleaſed to confeſſe their having receiv'd more Information and Satisfaction in theſe Papers then *I* durſt pretend to give them: though indeed the Subject is ſo noble and important, and does ſo much want the being illuſtrated by ſome diſtinct and Experimental Diſcourſe, that *not onely* if *I* did not ſuſpect my Friends of Partiality, I ſhould hope that It may gratify many Readers, and inſtruct more then a few: but ſuch as it is, I do not altogether diſpair, that it will prove neither unacceptable, nor uſeleſſe. And indeed the doctrines of Forms and Qualities, and Generation, and Corruption, and Alteration are wont to be treated of by Scholaſtical Philoſophers, in ſo obſcure, ſo perplex'd, and ſo unſatisfactory a way, and their Diſcourſes upon theſe Subjects do conſiſt ſo much more of Logical and Metaphyſical Notions and Niceties, then of Phyſical Obſervations and Reaſonings, that it is very difficult for any Reader of but an ordinary Capacity, to underſtand what they mean, and no leſſe difficult for any intelligent and unprejudic'd Reader to acquieſce in what they teach: which is oftentimes ſo precarious, and ſo contradictious to its ſelf, that moſt Readers (without alwaies excepting ſuch as are Learned and Ingenious) frighted by the darkneſs and difficulties wherewith theſe Subjects have been ſurrounded, do not ſo much as look after or read over theſe general and controverted matters, about which the Schools make ſo much noiſe; but deſpairing to find any ſatiſfaction in the ſtudy of them, betake Themſelves immediately to that part of Phyſicks that treats of particular Bodies: ſo that to Theſe it will not be unacceptable to have any intelligible Notions offer'd them of thoſe Things, which, as they are wont to be propoſ'd, are not wont to be underſtood: though yet the Subjects themſelves, if I miſtake not, may be juſtly reckon'd not onely amongſt the nobleſt and moſt important, but (in caſe they be duely propoſ'd,) among the uſefulleſt and moſt delightful Speculations, that belong to Phyſicks.

I conſider too, that among thoſe that are inclin'd to that Philoſophy, which, I find, I have been much imitated in calling *Corpuſcularian*, there are many Ingenious Perſons, eſpecially among the Nobility and Gentry, who, having been firſt drawn to like this new way of Philoſophy, by the ſight of ſome Experiments, which for their Novelty or Prettineſs they were much pleaſ'd with, or for their Strangeneſs they admir'd, have afterwards delighted Themſelves to make, or ſee variety of Experiments, without having ever had the Opportunity to be inſtructed in the Rudiments or fundamental Notions of that Philoſophy, whoſe pleaſing or amazing Productions have enamour'd them of It. And as Our *Pyrophilus*, for whom theſe Notes were drawn up, did in ſome regards belong to this ſort of *Virtuoſi*, ſo tis not impoſſible, but that ſuch Readers, as He was then, will not be ſorry to meet with a Treatiſe, wherein though my chief and proper buſineſſe be the giving ſome Account of the Nature and Origine of Forms and Qualities; yet by reaſon of the connexion and dependance betwixt theſe and divers of the other principal Things, that belong to the general part of Phyſicks, I have been oblig'd to touch upon ſo many other important Points, that this Tract may, in ſome ſort, exhibit a Scheme of, or ſerve for an Introduction into the Elements of the Corpuſcularian Philoſophy.

And as thoſe Readers, that have had the Curioſity to peruſe what is commonly taught in the Schools about Forms, and Generation, and Corruption, and thoſe other things we have been mentioning, and have (as is uſual among ingenious Readers) quitted the ſtudy of thoſe unſatisfactory intricacies with Diſguſt, will not be diſpleaſ'd to find in our Notes ſuch Explications of thoſe things as render them at leaſt intelligible: ſo it will not perhaps prove unacceptable to ſuch Readers, to find thoſe matters, which the Schools had interwoven with *Ariſtotle's* Doctrine, reconcil'd and accommodated to the Notions of the Corpuſcular Phyſicks.

If it be ſaid, that I have left divers things unmention'd, which are wont to be largely treated of by the *Ariſtotelians*, and particularly have omitted the Diſcuſſion of ſeveral Queſtions, about which they are wont very ſolemnly and eagerly to contend, I readily acknowledge it to be true: But I anſwer further, That to do otherwiſe then I have done, were not agreeable to the nature of my Deſign, as is declar'd in the Preface to *Pyrophilus*; and that though moſt Readers will not take notice of it, yet ſuch as are converſant in that ſort of Authors, will, I preſume, eaſily find, that I have not left them unconſulted, but have had the Curioſity to reſort to ſeveral both of the more, and of the leſſe recent Scholaſtical Writers about Phyſicks, and to ſome of the beſt Metaphyſicians to boot, that *I* might the better inform my ſelf, both what their Opinions are, and upon what arguments they are grounded. But as I found thoſe Inquiries far more troubleſome then uſeful, ſo I doubt not, that my omiſſions will not much diſpleaſe that ſort of Readers, for whoſe ſake chiefly tis that theſe Papers are permitted to be made publick. For if *I* ſhould increaſe the Obſcurity of the Things themſelves I treat of, by adding the ſeveral Obſcurer Comments (rather then Explications,) and the perplex'd and contradictious Opinions I have met with among Scholaſtick Writers, I doubt that ſuch perſons, as I chiefly write for, would inſtead of better comprehending what I ſhould *ſo* deliver, abſolutely forbear to read it. And there being many Doctrines, to which number This we are ſpeaking of ſeems to belong, wherein the ſame innate Light, or other Arguments, that diſcover the Truth, do likewiſe ſufficiently ſhew the Erroneouſneſs of diſſenting Opinions, *I* hope it may ſuffice to propoſe and eſtabliſh the Notions that are to be imbrac'd, without ſollicitouſly diſproving what cannot be true, if thoſe be ſo. And indeed there are many Opinions and Arguments of good repute in the Schools, which do ſo entirely rely upon the Authority of *Ariſtotle*, or ſome of his more celebrated Followers, that where that Authority is not acknowledg'd, to fall upon a ſolemn Confutation of what has been ſo precariouſly advanc'd, were not onely unneceſſary, but indiſcreet even in a Diſcourſe not confin'd to the brevity challeng'd by the nature of this of Ours. And there are very many Queſtions and Controverſies, which though hotly and clamorouſly contended about, and indeed pertinent and fit enough to be debated in their Philoſophy, do yet ſo much ſuppoſe the Truth of ſeveral of their Tenents, which the new Philoſophers reject, *or* are grounded upon Technical Terms or forms of ſpeaking, that ſuppoſe the Truth of ſuch Opinions, or are Expreſſions, whereof we neither do, nor need make any uſe; that to have inſerted ſuch Debates into ſuch a Diſcourſe as mine, would have been not onely tedious, but impertinent. As (for inſtance) thoſe grand Diſputes, whether the four Elements are endow'd with diſtinct Subſtantial Forms, or have onely their proper Qualities inſtead of them? and whether they remain in mix'd Bodies according to their Forms, or according to their Qualities? and whether the former or the latter of thoſe be, or be not refracted? Theſe, I ſay, and divers other controverſies about the four Elements, and their manner of Miſtion, are quite out of doors in their Philoſophy, that acknowledge neither, that there are four Elements, nor that Cold, Heat, Dryneſſe, and Moiſture, are, in the Peripatetick ſenſe, firſt Qualities, or that there are any ſuch Things as Subſtantial Forms *in rerum naturâ*. And it made me the more unwilling to ſtuff theſe Papers with any needleſs

School-controverſies, becauſe I found, upon peruſal of ſeveral Scholaſtick Writers, (eſpecially the recenter, who may probably be ſuppoſ'd to be the moſt refin'd,) that they do not alwaies mean the ſame Things by the ſame Terms, but ſome imploy them in one ſenſe, others in another, and ſometimes the ſame Writer uſes them in very differing ſenſes; which I am oblig'd to take notice of, that ſuch Readers,as have conſulted ſome of thoſe Authors, may not accuſe me of miſtaking or injuring ſome of the Scholaſtical Terms and Notions he may meet with in theſe Papers, when I have onely imploy'd Them in the ſenſe of other School-writers, which I judg'd preferrible. And this puts me in mind of intimating, That whereas, on the contrary, I ſometimes imploy variety of Terms and Phraſes to expreſs the ſame Thing, I did it purpoſely, though perhaps to the prejudice of my own Reputation, for the Advantage of *Pyrophilus*; both I and others having obſerved, that the ſame unobvious Notions being ſeveral wayes expreſs'd, ſome Readers even among the Ingenioufer ſort of them,will take it up much better in one of thoſe Expreſſions, and ſome in another.

But perhaps it will be wondred at, even by ſome of the new Philoſophers, That diſſenting ſo much as I do from *Ariſtotle* and the Schoolmen, I ſhould overlook or decline ſome Arguments, which ſome very ingenious Men think to be of great force againſt the Doctrine I oppoſe. But divers of theſe Arguments being ſuch, as the Logicans call *ad hominem*, I thought I might well enough ſpare them. For I have obſerv'd *Ariſtotle* in his Phyſicks to write very often in ſo dark and ambiguous a way, that tis far more difficult, then one would think, to be ſure what his Opinion was: and the Unlearned, and too frequently jarring Gloſſes of his Interpreters, have often made the Comment darker then the Text: ſo that (though in moſt it Be, yet) in divers caſes tis not eaſie (eſpecially without the expence of many words) to lay open the Contradictions of the Peripatetick Doctrine; beſides, that the urging ſuch contradictions are oftentimes fitter to ſilence an unwary Adverſary, then ſatisfie a wary and judicious Reader. It being very poſſible, that a man may contradict himſelf in two ſeveral places of his Works, and yet not be in both of Them in the wrong. For one of his Aſſertions, though inconſiſtent with the other, may yet be conſiſtent with Truth. But this is not all I have to ſay on this Occaſion. For beſides, that having, for many reaſons, elſewhere mention'd, purpoſely forborn the reading of ſome very much, and, for ought I know, very juſtly Eſteem'd Diſcourſes about general *Hypotheſes*, tis very poſſible, that *I* may be a ſtranger to ſome of thoſe Arguments: beſides this, *I* ſay, *I* confeſs I have purpoſely forborn to make uſe of others, which I have ſufficiently taken notice of. For ſome of thoſe Ratiocinations would engage him that ſhould imploy them, to adopt an *Hypotheſis* or Theory, in which perhaps I am not ſo throughly ſatisfied and of which *I* do not conceive my ſelf to have, on this occaſion, any neceſſity to make uſe: and accordingly *I* have forborn to imploy Arguments, that are either grounded on, *or* ſuppoſe Indiviſible Corpuſcles, call'd *Atoms*, or any *innate motion* belonging to them; *or* that the Eſſence of Bodies conſiſts in Extenſion, *or* that a Vacuum is impoſſible; *or* that there are ſuch *Globuli cæleſtes*, *or* ſuch a *Materia ſubtilis*, as the Carteſians imploy to explicate moſt of the *Phænomena* of Nature. For theſe, and divers other Notions, I (who here write rather for the Corpuſcularians in general, then any party of them) thought it improper needleſly to take in, diſcourſing, *either* againſt thoſe, to whom theſe things appear as diſputable, as the Peripatetick Tenents ſeem to me; *or* for to ſatisfie an ingenious perſon, whom it were not fair to impoſe upon with *Notions*, that I did not my ſelf think proper.

And on the like Account I forbore ſuch *Arguments* as thoſe, that ſuppoſe, in Nature and Bodies inanimate, Deſigns, and Paſſions proper to Living, and perhaps peculiar to Intelligent Beings; and (ſuch as) ſome Proofs that are drawn from the Theology of the Schools: (which I wiſh leſſe interwoven with *Ariſtotle's* Philoſophy.) For though there be ſome things, which ſeem to be of this ſort, (as Arguments drawn from final cauſes in divers particulars that concern Animals,) which, in a ſound ſenſe, I not onely Admit, but Maintain: yet ſince, as they are wont to be propoſ'd, they are liable enough to be queſtion'd, I thought it expedient for my preſent deſign to prætermit them, as things that I do not abſolutely need; though the imploying ſome of Them would facilitate my Task. And this I did the rather, becauſe I alſo forbear to anſwer Arguments, that however vehemently and ſubtly urg'd by many of the modern Schoolmen of the Roman Catholick Communion, are either confeſſedly, or at leaſt really built upon ſome Theological Tenents of theirs, which, being oppoſ'd by the Divines of Other Churches, and not left unqueſtion'd by ſome Acute ones of their Own, would not be proper to be ſolemnly taken notice of by Me, whoſe Buſineſs, in this Tract, is to diſcourſe of Natural Things as a Naturaliſt, without invading the Province of Divines, by intermedling with Supernatural Myſteries, ſuch as thoſe, upon which divers of the Phyſico-Theological Tenents of the Schoolmen, eſpecially about real Qualities, and* the Separableneſs of Accidents from Subjects of Inhæſion, are *manifeſtly*, if not alſo *avowedly*, grounded. But to return to the other things I was owning to have left unmention'd; notwithſtanding all that I have been ſaying, I readily acknowledge, that in ſome recent Authors, that have been imbracers of the new Philoſophy, I have met with ſome paſſages, that might well and pertinently be taken into the following Diſcourſe, but that having been (as I formerly intimated) tranſcrib'd ſome years ago, I cannot now ſo conveniently Alter it: which I am the leſſe troubled at, becauſe theſe few additional Arguments, thought fit to illuſtrate or confirme, being not neceſſary to make-out what has been deliver'd, may ſafely be let alone, unleſſe there happen (as tis not unlikely there may) an occaſion of reprinting theſe Notes, with ſuch Enlargements as may make them the more fit to be an Introduction into the Corpuſcular Philoſophy.

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* *Atque hæc ſententia* (of the Diſtinction and Separableneſs of Quantity from Matter) *eſt omnino tenenda: quanquam enim non poſſit ratione naturali ſufficienter demonſtrari, tamen ex principiis Theologiæ convincitur eſſe vera, maximè propter myſterium* Euchariſtiæ: Suarez diſp. Metaph 40.p.m.341. pauciſq; interjectis,—*prima ratio pro hac ſententia eſt, quia in myſterio* Euchariſtiæ *Deus ſeparavit quantitatem à ſubſtantiis panis & vini*, &c. & p. m. 342.—*Hæc reſponſio & ſententia* [Adverſariorum] *ſic explicata non poteſt facilè & evidenter impugnari, ſiſtendo in puro naturali; nihilominus tamen, partim ratione naturali, partim adjuncto myſterio ſufficientiſſimè improbatur.*

I hope then upon the whole matter, that I have pitch'd upon that way, that was the moſt conducive to my Deſign, *partly* by inſiſting onely on thoſe Opinions, whether true or falſe, which, for their importance or Difficulty, ſeem'd to deſerve to be particularly either explicated or diſprov'd; and *partly*, by chooſing to imploy ſuch Arguments as I thought the cleareſt, and cogenteſt, and by their aſſuming the leaſt of any, ſeem'd the eaſieſt to be vindicated from Exceptions: without troubling my ſelf to anſwer Objections, that appear'd rather to be drawn from Metaphyſical or Logical Subtleties, or to be grounded upon the Authority of men, then to be Phyſical Ratiocinations, founded upon Experience, or the nature of the Things under debate; eſpecially having, in the propoſal and confirmation of the Truth, ſo laid the grounds, and intimated the wayes of anſwering what is like to be colourably objected againſt it, that an Ingenious man may well enough furniſh himſelf with Weapons to defend the Truth, out of the Notions, Hints, and Experiments, wherewith in this Tract care has been taken to accompany it. And my forbearing to proſecute ſome of the Peripatetick Controverſies any further then I have done, will not, I hope, be blam'd by Them, that have obſerv'd as well as I, how much thoſe Diſputes are wont to be lengthned by ſuch frivolous Diſtinctions, as do not deſerve to be ſolemnly examin'd, eſpecially in ſuch a Compendious Treatiſe as Ours. For an attentive Reader needs not be much converſant with the writings of the modern Peripateticks, about ſuch ſubjects as Subſtantial Forms, Generation, Corruption, &c. to take notice, that tis their Cuſtome, when they find Themſelves diſtreſ'd by a ſolid Argument, to endeavour to elude it by ſome pittifull Diſtinction or other, which is uſually ſo groundleſſe, and ſo unintelligible, or ſo nugatory, or ſo impertinent to the Subject, or at leaſt ſo inſufficient for the purpoſe 'tis alleadg'd for, that to vouchſafe it a ſollicitous Confutation might queſtion a Writers Judgment with intelligent Readers; who by ſuch inſignificant Diſtinctions are ſatisfy'd of nothing ſo much, as that the Framers of them had rather ſay (that which indeed amounts to) nothing, then not ſeem to ſay ſomething. And of ſuch Evaſions they may probably be emboldned to make uſe, by the practice of *Ariſtotle* himſelf, to whom ſuch obſcure and unſatisfactory Diſtinctions are ſo familiar, that I remember one of his own Commentators * (and he one of the moſt judicious) could not forbear, upon a certain Text of his Maſters, to complain of it, and particularly to take notice, that That one Diſtinction of *actu & potentia* runs through almoſt all *Ariſtotle's* Philoſophy, and is imploy'd to ſhift off thoſe Difficulties he could not clearly Explicate.

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* The Author here meant is the Inquiſitive Peripatetick *Cabæus*, who in one place hath theſe words. ***Ut hanc*** *quæſtionem ſolvat, recurrit ad illam diſtinctionem ſibi valde familiarem; quâ utitur Ariſtoteles in tota ſua Philoſophia, quoties obviam habet aliquam gravem difficultatem, diſtinguit enim actu vel potentia*, &c. In another theſe: —*Quæ eſt diſtinctio quædam familiaris Ariſtoteli, quam applicat omnibus rebus, ubi difficultates urgent, & videtur iſtis vocibus quaſi fatali gladio omnes reſcindere difficultatis nodos; vix enim eſt difficultas, cui non putat ſe ſatisfacere diſtinguendo* actu *&* potentiâ.

By which nevertheleſs I would not be underſtood to cenſure or decry the whole Peripatetick Philoſophy, much leſſe to deſpiſe *Ariſtotle* himſelf; whoſe own Writings give me ſometimes cauſe a little to wonder, to find ſome Abſurdities ſo confidently father'd upon him by his Scholaſtick Interpreters. For I look upon *Ariſtotle* as *one* (though but as *one amongſt many*) of thoſe fam'd Antients, whoſe Learning about *Alexanders* time enobled *Greece*; and I readily allow him moſt of the prayſes due to great Wits, excepting thoſe which belong to clear-headed Naturaliſts. And I here declare, once for all, that where in the following Tract, or any other of my writings, I do *indefinitely* depreciate *Ariſtotle's* Doctrine, I would be underſtood to ſpeak of *his Phyſicks*, or rather of the Speculative part of them, (for his Hiſtorical VVritings concerning Animals I much eſteem,) nor do I ſay, that even Theſe may not have their Uſe among Scholers, and even in Univerſities, if they be retain'd and ſtudied with due cautions and Limitations; (of which I have elſewhere ſpoken.)

But to reſume the Diſcourſe, whence the Peripatetick Diſtinctions tempted me to digreſs; by any thing I formerly ſaid, I would not in the leaſt diſparage thoſe excellent and eſpecially thoſe modern Authors, that have profeſſedly oppoſed the *Ariſtotelian* Phyſicks: (ſuch as *Lucretius*, *Verulam*, *Baſſo*, *Des Cartes* and his Followers, *Gaſſendus*, the two *Boots*, *Magnenus*, *Pemble*, *Helmont*,) nor be thought to have made no uſe of any of their Cogitations or Arguments. For though ſome of their Books I could not procure, when I had occaſion to have recourſe to Them; and though the weakneſs of my Eyes diſcourag'd me from peruſing thoſe parts of others, that concern'd not the Subject I was treating of, yet I hope I have been benefitted by thoſe I have conſulted, and might have been more ſo, by the Learned *Gaſſendus's* Little, but Ingenious, *Syntagma Philoſophiæ Epicuri*, if I had more ſeaſonably been acquainted with it.

But *whether* we have treated of the Nature and Origine of Forms and Qualities in a more comprehenſive way then others, *whether* we have by new and fit Similitudes, and Examples, and other means rendred it more intelligible then they have done, *whether* we have added any conſiderable number of Notions and Arguments, towards the compleating and confirming of the propoſ'd *Hypotheſis*, *whether* we have with reaſon diſmiſsd Arguments unfit to be relyd on, and *whether* we have propoſ'd ſome Notions and Arguments ſo warily, as to keep Them from being lyable to Exceptions or Evaſions,whereto they were obnoxious as others have propoſ'd them, *whether* (I ſay) we have done all or any of theſe in the firſt or Speculative part of this Treatiſe, we willingly leave the Reader to judge: But in the ſecond or Hiſtorical part of It, perhaps he will be invited to grant, that we have done that part of Phyſicks, we have been treating of, ſome little ſervice: ſince by the Lovers of real Learning, it was very much wiſh'd, that the Doctrines of the new Philoſophy (as tis call'd) were back'd by particular Experiments;the want of which I have endeavour'd to ſupply, by annexing ſome, whoſe Nature and Novelty I am made believe will render them as well Acceptable as Inſtructive. For though, that I might not anticipate what belongs to other papers, I did not make the Laſt *Section* conſiſt of above a Decad of them; and though, for the reaſons intimated in the Advertiſements premiſ'd to them, I did not expreſly mention to *Pyrophilus* all that I could have told him about them; yet I have been carefull ſo to chooſe them, and to interweave Hints in delivering them, that a ſagacious Reader, who ſhall have the Curioſity to try them heedfully, and make Reflexions on the ſeveral *Phænomena*, that in likelihood will occurr to him, will (if I miſtake not) receive no contemptible information, as of ſome other things, ſo particularly about the nature of Mixtions, (which I take to be one of the moſt important and uſeful, though neglected and ill underſtood, Doctrines of the Practical part of Phyſicks) and may probably light upon more then he Expects, or I have fully Delivered, and perhaps too more then I Foreſaw.

And though ſome *Virtuoſi*, more converſant perhaps with Things then Books, preſuming the Decay of the *Peripatetick* Philoſophy to be every where as great, as tis among Them in *England*, may think that a Doctrine, which they look on as Expiring, need not have been ſo ſollicitouſly confuted; yet thoſe that know, how deep rooting this Philoſophy has taken (both elſewhere, and particularly) in thoſe Academies, where it has flouriſh'd for many Ages, and in ſome of which tis, excluſively to the Mechanical *Philoſophy*, water'd and fenced by their Statutes or their Superiours: and he that alſo knows, how much more eaſie ſome (more ſubtle, then Candid) Wits, find it plauſibly to defend an Error, then ingeniouſly to confeſs it; will not wonder, that I ſhould think, that a Doctrine ſo advantag'd, though it be too erroneous to be Fear'd, is yet too conſiderable to be Deſpiſ'd. And not to queſtion, whether ſeveral of thoſe, that moſt contemn the favourers of the *Peripatetick Hypotheſis*, as the later Diſcoveries have reduc'd them to Reform it, be not the leaſt provided to anſwer their Arguments: (not to queſtion this, I ſay,) there are divers of our Adverſaries (miſled onely by Education, and morally harmleſs prejudices) who do ſo much Deſerve a better Cauſe, then that which Needs all their ſubtlety without being VVorthy of it, that I ſhall think more paines, then I have taken, very uſefully beſtow'd, if my Arguments and Experiments prove ſo happy, as to undeceive Perſons, whoſe parts, too unluckily confin'd to Narrow and Fruitleſs Notions, would render them illuſtrious Champions for the Truths they are able ſo Subtlely to oppoſe; and who might queſtionleſs perform Conſiderable things, if they imploy'd as much Dexterity to Expound the Myſteries of Nature, as the Riddles of the School-men; and laid out their VVit and Induſtry to ſurmount the Obſcurity of Her works in ſtead of that of *Ariſtotles.*

There might be a few other particulars fit to be taken notice of in this *Preface*, but finding that I had already mention'd them in that, which I had addreſs'd to *Pyrophilus*, my Haſt makes me willing rather to refer the Reader thither for them, then Alter that, or Lengthen this, (which I ſhould think much too Long already, if it were not poſſible that it may hereafter prove Præliminary to more papers then theſe tis now premiſ'd to.) So that there remaines but one Advertiſement neceſſary to be given here, namely, that whereas in the following Notes I ſeveral times ſpeak of the Author of the Eſſay of Salt-petre, as of a third perſon, the Occaſion of that was, That when theſe Notes, and ſome about particular Qualities, were written, I had a Deſign to make two diſtinct ſorts of Annotations upon that Eſſay; in the *former* whereof (which now comes forth) I aſſumed the perſon of a Corpuſcularian, and diſcourſt at that rate. But I had thoughts too (in caſe God were pleaſ'd to grant me Life and Opportunity,) to take a *ſecond* Review both of the Treatiſe it ſelf, and of the Notes on it, and on that occaſion to Adde what my riper Thoughts and further Experience might ſuggeſt unto me. And that in my Animadverſions I might, with the more Freedome and Conveniency, Adde, Explain, Alter, and even Retract, as I ſhould ſee cauſe, I thought it not amiſs to write them, as if they were made on the VVork of another. By which Intimation the Reader may be aſſiſted to gheſs how much I intended in the following Diſcourſe, (in which, as in the *Prefaces* belonging to it, I play the Corpuſcularian,) to reſerve my ſelf the Freedom of Queſtioning, and Correcting, upon the deſign'd Review, any thing deliver'd in theſe Notes; and how much more it was in them my deſign to bring *Pyrophilus* Experiments and Queries to Illuſtrate obſcure matters, then, by haſty Aſſertions, to Dogmatize about them.

The Præface.

THe Origine (Pyrophilus) *and Nature of the Qualities of Bodies, is a Subject, that I have long lookt upon, as one of the moſt Important and Uſefull that the Naturaliſt can pitch upon for his Contemplation. For the Knowledge we have of the Bodies without Us, being for the Moſt part fetched from the Informations the Mind receives by the Senſes, we ſcarce know any thing elſe in Bodies, upon whoſe account they can worke upon our Senſes ſave their Qualities: For as to the Subſtantial Formes, which ſome Imagine to be in all Naturall Bodies, it is not halfe ſo Evident, that there are ſuch, as it is, that the wiſeſt of thoſe that do admit them, Confeſſe, that they do not well Know them.* * *And as tis by their Qualities, that Bodies act Immediately upon our*

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*Nego tibi ullam eſſe formam nobis notam plenè & planè: noſtrámque ſcientiam eſſe umbram in ſole. Scaliger : (*of whoſe confeſſion to the ſame purpoſe, more are cited hereafter.*)

Senſes, ſo 'tis by vertue of thoſe Attributes likewiſe, that they act upon Other bodies, & by that action produce in Them, & oftentimes in Themſelves thoſe Changes, that ſometimes we call Alterations, and ſometimes Generation, or Corruption.

And 'tis chiefly by the Knowledge, ſuch as it is, that Experience, (not Art) hath taught Us, of theſe differing Qualities of Bodies, that we are enabled, by a due application of Agents to Patients, to exerciſe the little Empire, that we have either Acquir'd or Regain'd over the Creatures. But I think not the contemplation of Qualities more Noble & Uſeful, then I find it Difficult; For what is wont to be taught us of Qualities in the Schools, is ſo Slight and ill grounded, that it may be doubted, whether they have not rather Obſcured, then Illuſtrated the things they ſhould have explain'd. And I was quickly diſcouraged from expecting to learne much from them, of the Nature of divers Particular Qualities, when I found, that except ſome few, which they tell You in

General may be deduced,(by wayes they leave thoſe to gueſſe at that can,) from thoſe foure Qualities, they are pleas'd to call the Firſt; they confeſſe, that the reſt ſpring from thoſe Forms of Bodies, whoſe particular Natures, the judicioufeſt of them acknowledge, they cannot comprehend. And Ariſtotle *himſelf not only doth (as we ſhall ſee anon) give us of Qualitie in Generall, (which yet ſeems far more eaſily defineable, then many a Particular Quality,) no other then ſuch a definition, as is as Obſcure, as the thing to be declared by it; but I Obſerve not without ſome wonder, that in his eight Books of* Phyſicks,*where he profeſſedly treats of the Generall Affections of Naturall things, he leaves out the Doctrine of Qualities; as after him* Magirus, *and divers other Writers of the Peripatetick Phyſiologie have done: which (by the way) I cannot but look upon as an Omiſſion, ſince Qualities doe as well ſeem to belong to Naturall Bodies Generally conſider'd, as Place, Time, Motion, and thoſe other things, which upon that* *account are wont to be Treated of in the Generall part of Natural Philoſophy. The moſt Ingenious* Des Cartes *has ſomething concerning ſome Qualities; but though for Reaſons elſewhere expreſs'd, I have purpoſely Forborn to peruſe his Syſteme of Philoſophy; yet I find by Turning over the Leaves that he has Left moſt of the other Qualities Untreated of, & of Thoſe, that are more properly call'd Senſible, he Speaks but very Briefly & Generally; rather conſidering what they do upon the Organs of Senſe, then what Changes happen in the Objects themſelves, to make them Cauſe in us a Perception ſometimes of one Quality, and ſometimes of Another. Beſides, that his Explications, do many of them ſo depend upon His peculiar Notions, (of a* Materia Subtilis, Globuli Secundi Elementi, *and the like) and Theſe, as it became ſo Great a Perſon, he has ſo Interwoven with the reſt of his Hypotheſis, that They can ſeldome be made Uſe of, without Adopting his whole Philoſophy.* Epicurus *indeed, and his Scholiaſt* Lucretius, *have Given ſome good Hints concerning the Nature of ſome few Qualities. But beſide, that even theſe Explications are divers of them either Doubtfull or Imperfect, or both, there are many other Qualities, which are left for Others to Treat of. And this is the Second and Maine Difficulty, which I find in inveſtigating the Nature of Qualities, Namely, that Whatever be to be thought of the Generall Theoryes of* Ariſtotle, *or other Philoſophers, concerning Qualities; we evidently Want That, upon which a Theory, to be Solid and Vſefull, muſt be Built; I mean an Experimentall Hiſtory of them. And this we ſo Want, that except perhaps what Mathematicians have done concerning Sounds, and the Obſervations (rather then Experiments) that our Illuſtrious* Verulam *hath (in ſome few Pages) ſay'd of Heat, in his ſhort* Eſſay, De Formâ Calidi; *I know not Any one Quality, of which any Author has yet Given us an any thing competent Hiſtory. Theſe things I mention to You,* Pyrophilus, *not* *at all to derogate from thoſe Great Men; whoſe deſign ſeems rather to have been to deliver Principles and Summaries of Philoſophy, then to inſiſt upon Particulars; but for this purpoſe, that ſince the Nature of Qualities is ſo* beneficiall *a ſpeculation, my labours may not be look'd upon as wholly Uſeleſſe, though I can contribute but a little to the clearing of it: and that ſince 'tis ſo* abſtruſe *a ſubject, I may be pardon'd, if I ſometimes miße the marke, and leave diverſe things uncompleated; That being but what ſuch great* Philoſophers *have done before mee.*

But, Pyrophylus, *before I proceed to give You my Notes upon this part of our Author's Eſſay, that you may rightly underſtand my Intention in them, it will be requiſite to give you three or foure Advertiſements.*

And firſt, when ever I ſhall ſpeake indefinitely of Subſtantiall forms, I would alwayes be underſtood to except the Reaſonable Soule, that is ſaid to inform the humane Body; which Declaration I here deſire may be taken

taken notice of, once for all.

Secondly, Nor am I willing to treat of the Origine of Qualities in beaſts; partly becauſe I would not be engaged to examine, of what Nature their Soules are, and partly becauſe it is difficult in moſt caſes, (at leaſt for one, that is compaſſionate enough,) either to make experiments upon Living animals, or to judg what influence their Life may have, upon the change of Qualities, produc'd by ſuch Experiments.

Thirdly, *The occaſion of the following Reflections, being onely this; that our Author in that part of his Eſſay concerning Salt-peter, whereto theſe Notes referre, does briefly Intimate ſome Notions about the Nature and Origine of Qualities; You muſt not exſpect, that I, whoſe Method leads me but to Write ſome Notes upon this, and ſome other parts of this* Eſſay, *ſhould make Solemne or Elaborate diſcourſes concerning the Nature of particular Qualities, and that I ſhould fully deliver my own apprehenſions concerning thoſe*

Subjects. For as I elſewhere ſufficiently Intimate, that in theſe firſt Notes I Write as a Corpuſcularian, *& ſet down thoſe Things onely, that ſeem to have a tendency to Illuſtrate or Countenance the Notions or Fancies imply'd in our Author's* Eſſay: *So I muſt here Tell you, that I neither have now the Leaſure, nor Pretend to the Skill, to deliver Fully the Hiſtory, or to Explicate Particularly the Nature of Each ſeveral Quality.*

Fourthly, *But I conſider, that the Schools have of late much Amus'd the World, with a way they have got, of Referring all Naturall Effects to certain Entities, that they call* Reall Qualities, *and accordingly Attribute to them a Nature diſtinct from the Modification of the Matter they belong to, & in ſome caſes Separable from all Matter whatſoever, by which Meanes they have, as farre forth as their Doctrine is Acquieſc'd in, made it thought Needleſſe or Hopeleſs for men to Employ their Induſtry, in ſearching into the Nature of Particular Qualities, & their Effects. As if, (for Inſtance) it be Demanded,*

manded, how Snow comes to dazle the Eyes, they will anſwer, that 'tis by a Quality *of Whiteneſs that is in It; which makes all very white Bodies produce the ſame Effect; And if You, ask what this Whiteneſs is, They will tell you no more in ſubſtance, then that tis a* reall Entity, *which denominates the Parcel of Matter, to which it is Joyn'd, White; & if You further Enquire, what this real Entity, which They call a Quality, is, You will find, as Wee ſhall ſee anon, that They either Speak of it much after the ſame rate, that They do of their Subſtantiall Forms; (as indeed ſome of the Modern'ſt teach, That a Quality affects the Matter it belongs to,* per modum formæ ſecundariæ, *as they ſpeak) or at leaſt they will not Explicate it more Intelligibly.*

And accordingly if you further Ask them, how white Bodies in Generall do rather Produce this effect of dazling the Eyes, then Green or Blew ones, inſtead of being told, that the former ſort of Bodies reflect Outwards, and ſo to the Eye farre more of the Incident Light, then the Latter; You ſhall perchance *be told, that 'tis their reſpective Natures ſo to act, by which way of diſpatching difficulties, they make it very* eaſy *to ſolve All the Phænomena of Nature in Generall, but make men think it* impoſſible *to explicate almoſt Any of them in Particular.*

And though the Unſatisfactoriſneſs and Barrenneſſe of the School-Philoſophy have perſwaded a great many Learned Men, eſpecially Phyſicians, to ſubſtitute the Chymiſts Three principles, inſtead of thoſe of the Schools; and though I have a very good opinion of Chymiſtry it ſelf, as 'tis a Practicall Art; yet as 'tis by Chymiſts pretended to containe a Syſteme of Theoricall Principles of Philoſophy, I fear it will afford but very little ſatisfaction to a ſevere enquirer, into the Nature of Qualities. For beſides that, as we ſhall more particularly ſee anon, there are Many Qualities, which cannot with any probability be deduc'd from Any of the three Principles; thoſe that are aſcrib'd to One, or other of them, cannot Intelligibly be explica-

ted, without recourſe to the more Comprehenſive Principles of the Corpuſcularian Philoſophy. To tell us, for inſtance, that all Solidity proceeds from Salt, onely informing us, (*where it can plauſibly be pretended*) in what *materiall principle or* ingredient *that Quality* reſides, *not* how *it is* produced; *for this doth not teach us,* (*for example*) how *Water even in exactly clos'd veſſels comes to be frozen into Ice; that is, turn'd from a fluid to a Solid Body, without the acceſſion of a ſaline ingredient (which I have not yet found pretended, eſpecially Glaſſe being held Impervious to Salts.) Wherefore,* Pyrophilus, *I thought it might much conduce to the underſtanding the Nature of Qualities, To ſhew how they are Generated; and by the ſame way, I hop'd it might remove in ſome meaſure the obſtacle, that theſe Dark and Narrow Theories of the Peripateticks and Chymiſts may prove to the Advancement of ſolid and uſefull Philoſophy. That then, which I chiefly aime at, is to make it Probable to you by*

Experiments, (which I Think hath not yet beene done:) That allmoſt all ſorts of Qualities, moſt of which have been by the Schooles either left Unexplicated, or Generally referr'd, to I know not what Incomprehenſible Subſtantiall Formes; may *be produced Mechanically, I mean by ſuch Corporeall Agents, as do not appear, either to Work otherwiſe, then by vertue of the Motion, Size, Figure, and Contrivance of their own Parts, (which Attributes I call the Mechanicall Affections of Matter, becauſe to Them men willingly Referre the various Operations of Mechanical Engines:) or to Produce the new Qualities exhibited by thoſe Bodies their Action changes, by any other way, then by changing the* Texture, *or* Motion, *or ſome other* Mechanical Affection *of the Body wrought upon. And this if I can in any Paſſable meaſure do, though but in a generall way, in ſome or other of each of theſe Three Sorts, into which the Peripateticks are wont to Divide the Qualities of Bodies, I hope I ſhall have done*

done no uſeleſſe Piece of Service to Natural Philoſophy, Partly *by exciting You, and Your Learned Friends, to Enquire after more Intelligible and Satisfactory wayes of explicating Qualities, and* Partly *by* Beginning *ſuch a Collection of Materials towards the* Hiſtory *of thoſe Qualities, that I ſhall the moſt largely Inſiſt on, as Heat, Colours, Fluidity and Firmneſſe, as may invite You, and other Ingenious Men, to contribute alſo their Experiments, and Obſervations to ſo Uſefull a VVork, and thereby lay a foundation, whereon You, and perhaps I, may ſuperſtruct a more Diſtinct and Explicite Theory of Qualities, then I ſhall at preſent adventure at. And though I Know, that ſome of the things my Experiments tend to Manifeſt, may likewiſe be Confirm'd by the more obvious Phænomena of Nature, yet I Preſume You will not diſlike my Choſing to entertaine You with the Former, (though without at all Deſpiſing, or ſo much as ſtrictly forbearing to Employ the Latter,) becauſe the Changes of Qualities made by*

Our Experiments will for the moſt part be more Quick & Conſpicuous, and the agents made uſe of to produce them, being of our own Applying, and oftentimes of our own Præparation, we may be thereby aſſiſted the better to judge of what they Are, and to make an æſtimate of what 'tis they Do.

CONSIDE-

CONSIDERATIONS,
AND
EXPERIMENTS
touching
the Origine of Qualities, and Forms.

The Theoricall Part.

THat before I deſcend to Particulars, I may (*Pyrophilus*) furniſh you with ſome General Apprehenſion of the Doctrine (or rather the *Hypotheſis*,) which is to be Collated *with*, and to be either Confirmed , or Diſproved by, the Hiſtoricall Truths, that will be deliver'd concerning Particular Qualities,(& Forms;) I will aſſume the perſon of a Corpuſcularian,and here, at the Entrance,give you (in a general way)a brief Account of the *Hypotheſis* it ſelfe, as it concernes the Origine of Qualities (and Forms:) and for Diſtinctions ſake,I ſhall comprize it in the Eight following Particulars, which, that the whole Scheme may be the better Comprehended,and as it were Survey'd under one Proſpect, I ſhall do little more then Barely propoſe *Them*, that either ſeem evident enough by their owne Light,or may without Præjudice have diverſe of their Proofes reſerv'd for proper places in the following part of this Treatiſe: and though there be ſome *Other* Particulars, to which the Importance of the Subjects, and the Greatneſſe of the (almoſt Univerſall) Prejudices,that lye againſt them, vvill oblige mee Immediately to annexe (for the ſeaſonable Clearing,and Juſtifying of them) ſome Annotations: yet that they may,as Little as I can,Obſcure the Cohærence of the vvhole Diſcourſe, as much of them as conveniently may be, ſhall be included in [ ] Paratheſes.

I. I agree with the generality of Philoſophers ſo far, as to allow, that there is one Catholick or Univerſal Matter common to all Bodies, by which I mean a Subſtance extended, diviſible and impenetrable.

II. But becauſe this Matter being in its own Nature but one, the diverſity we ſee in Bodies muſt neceſſarily ariſe from ſomewhat elſe, then the Matter they conſiſt of. And ſince we ſee not, how there could be any change in Matter, if all its (actual or deſignable) parts were perpetually at reſt among themſelves, it will follow, that to diſcriminate the Catholick Matter into variety of Natural Bodies, it muſt have Motion in ſome or all its deſignable Parts: and that Motion muſt have various tendencies, that which is in this part of the Matter tending one way, and that which is in that part tending another;

as we plainly ſee in the Univerſe or general Maſs of Matter there is really a great quantity of Motion, and that variouſly determin'd, and that yet diverſe portions of Matter are at reſt.

That there is Local Motion in many parts of Matter is manifeſt to ſenſe, but how Matter came by this Motion was of Old, and is ſtill hotly diſputed of: for the antient Corpuſcularian Philoſophers, (whoſe doctrine in moſt other points, though not in all, we are the moſt inclinable to,) not acknowledging an Author of the Univerſe, were thereby reduc'd to make Motion congenite to Matter, and conſequently coëval with it; but ſince Local Motion, or an Endeavour at it, is not included in the nature of Matter, which is as much Matter, when it reſts, as when it moves; and ſince we ſee, that the ſame portion of Matter may from Motion be reduc'd to Reſt, and after it hath continu'd at Reſt, as long as other Bodies doe not put it out of that ſtate, may by external Agents be ſet a moving again; I, who am not wont to think a man the worſe Naturaliſt for not being an Atheiſt, ſhall not ſcruple to ſay with an Eminent Philoſopher of Old, whom I find to have propoſ'd among the Greeks that Opinion (for the main) that the Excellent *Des Cartes* hath revived amongſt Us, That the Origine of Motion in Matter is from God; and not onely ſo, but that thinking it very unfit to be believ'd, that Matter barely put into Motion, and then left to it ſelf, ſhould Caſually conſtitute this beautiful and orderly World: I think alſo further, that the wiſe Author of Things did by eſtabliſhing the laws of Motion among Bodies, and by guiding the firſt Motions of the ſmall parts of Matter, bring them to convene after the manner requiſite to compoſe the World, and eſpecially did contrive thoſe curious and elaborate Engines, the bodies of living Creatures, endowing moſt of them with a power of propagating their Species: But though theſe things are my Perſwaſions, yet becauſe they are not neceſſary to be ſuppoſ'd here, where I doe not pretend to deliver any compleat Diſcourſe of the Principles of Natural Philophy, but onely to touch upon ſuch Notions, as are requiſite to explicate the Origine of Qualities and Forms, I ſhall paſs on to what remains, as ſoon as I have taken notice, that *Local Motion ſeems to be indeed the Principl amongſt Second Cauſes, and the Grand Agent of all that happens in Nature*: For though Bulk, Figure, Reſt, Situation, and Texture do concurre to the *Phænomena* of Nature, yet in compariſon of Motion they ſeem to be in many Caſes, Effects, and in many others, little better then *Conditions*, or *Requiſites*, or Cauſes *ſine quibus non*, which modifie the operation, that one part of Matter by vertue of its Motion hath upon another,

nother: as in a Watch, the number, the figure, and coaptation of the Wheels and other parts is requiſite to the ſhewing the hour, and doing the other things that may be perform'd by the Watch; but till theſe parts be actually put into Motion, all their other affections remaine inefficacious: and ſo in a Key, though if it were too big, or too little, or if its Shape were incongruous to that of the cavity of the Lock, it would be unfit to be uſ'd as a Key, though it were put into Motion; yet let its bigneſs and figure be never ſo fit, unleſs actual Motion intervene, it will never lock or unlock any thing, as without the like actual Motion, neither a Knife nor Raſor will actually cut, how much ſoever their ſhape & other Qualities may fit them to do ſo. And ſo Brimſtone, what diſpoſition of Parts ſoever it have to be turn'd into Flame, would never be kindled, unleſs ſome actual fire, or other parcel of vehemently and variouſly agitated

Matter ſhould put the Sulphureous Corpuſcles into a very brisk motion.

III. Theſe two grand and moſt Catholick Principles of Bodies, Matter, and Motion, being thus eſtabliſh'd, it will follow both, that Matter muſt be actually divided into Parts, that being the genuine Effect of variouſly determin'd Motion, and that each of the primitive Fragments, or other diſtinct and entire Maſſes of Matter muſt have two Attributes, its own Magnitude, or rather *Size*, and its own *Figure* or *Shape*. And ſince Experience ſhews us (eſpecially that which is afforded us by Chymical Operations, in many of which Matter is divided into Parts, too ſmall to be ſingly ſenſible,) that this diviſion of Matter is frequently made into inſenſible Corpuſcles or Particles, we may conclude, that the minuteſt fragments, as well as the biggeſt Maſſes of the Univerſal Matter are likewiſe endowed each with its peculiar Bulk and

Shape. For being a finite Body; its Dimenſions muſt be terminated and meaſurable: and though it may change its Figure, yet for the ſame reaſon it muſt neceſſarily have *ſome Figure* or other. So that now we have found out, and muſt admit three Eſſential Properties of each entire or undivided, though inſenſible part of Matter, namely, *Magnitude*, (by which I mean not quantity in general, but a determin'd quantity, which we in Engliſh oftentimes call the *Size* of a bodie,) *Shape*, and either *Motion* or *Reſt*, (for betwixt them two there is no mean:) the two firſt of which may be called *inſeparable Accidents* of each diſtinct part of Matter: *inſeparable*, becauſe being extended, and yet finite, it is Phyſically impoſſible, that it ſhould be devoid of ſome Bulk or other, and ſom determinate Shape or other; and yet *Accidents*, becauſe that whether or no the Shape can by Phyſical Agents be alter'd or the Body ſubdivided,

vided, yet mentally both the one and the other may be done, the whole eſſence of Matter remaining undeſtroy'd.

Whether theſe Accidents may not conveniently enough be call'd the Moods or primary affections of Bodies, to diſtinguiſh them from thoſe leſſe ſimple Qualities, (as Colours, Taſtes, and Odours,) that belong to Bodies upon their account, or whether with the Epicureans they may not be called the Conjuncts of the ſmalleſt parts of Matter, I ſhall not now ſtay to conſider, but one thing the Modern Schools are wont to teach concerning Accidents, which is too repugnant to our preſent Doctrine, to be in this place quite omitted, namely that there are in Natural Bodies ſtore of *real Qualities*, and other *real Accidents*, which not onely are no Moods of Matter, but are real Entities diſtinct from it, and according to the doctrine of many modern Schoolmen may *exiſt ſeparate* from all

Matter whatſoever. To clear this point a little, we muſt take notice, that *Accident* is among Logicians and Philoſophers uſ'd in two ſeveral ſenſes, for ſometimes it is oppoſ'd to the 4th Prædicable, (*Property*,) and is then defin'd, " that which may be preſent or abſent, without the deſtruction of the ſubject; as a Man may be ſick or well, and a Wall white or not white, and yet the one be ſtill a Man, the other a Wall; and this is call'd in the Schools *Accidens prædicabile*, to diſtinguiſh it from what they call *Accidens prædicamentale*, which is oppoſ'd to Subſtance: for when things are divided by Logicians into 10 Prædicaments, or higheſt genus'es of things, Subſtance making one of them, all the nine other are of Accidents. And as Subſtance is commonly defin'd to be a thing that ſubſiſts of it ſelf, and is the ſubject of Accidents, (or more plainly, a real Entity or thing, that needs not any (*created*) Being, that it may exiſt:)

ſo an Accident is ſaid commonly to be *id cujus eſſe eſt ineſſe*, and therefore *Ariſtotle*, who uſually calls Subſtances ſimply ὄντα, Entities, moſt commonly calls Accidents ὄντος ὄντα, Entities of Entities. Theſe needing the exiſtence of ſome ſubſtance or other, in which they may be, as in their ſubject of Inhæſion. And becauſe Logicians make it the diſcriminating note of Subſtance, and Accident, that the former is a thing that cannot be in another, as in its ſubject of Inhæſion, tis requiſite to know, that according to them, That is ſaid to *Be in a Subject*, which hath theſe three conditions; That however it (1) *be in another thing*, (2) *is not in it as a part*, and (3) *cannot exiſt ſeparately* from the thing or ſubject, wherein it is: as a white Wall is the ſubject of Inhæſion of the whiteneſs we ſee in it, which ſelfſame whiteneſs, though it be not in the wall as a part of it, yet cannot the ſelfſame whiteneſs according to our Logicians exiſt any where out of the wall; though many other Bodies may have the like degree of whiteneſs. This premiſ'd, twill not be hard to diſcover the falſity of the lately mentioned Scholaſtick opinion touching real Qualities and Accidents, their doctrine about which does, I confeſs, appear to me to be either unintelligible, or manifeſtly contradictious: for ſpeaking in a Phyſical ſenſe, if they will not allow theſe Accidents to be Modes of Matter, but Entities really diſtinct from it, and in ſome caſes ſeparable from all Matter, they make them indeed Accidents in name, but repreſent them under ſuch a notion as belongs onely to Subſtances; the nature of a Subſtance conſiſting in this, That it can ſubſiſt of it ſelfe, without being in any thing elſe, as in a ſubject of Inhæſion: ſo that to tell us, that a Quality, or other Accident may ſubſiſt without a ſubject, is indeed, whatever they pleaſe to call it, to allow it the true Nature of Subſtance, nor will their Groundleſſe Diſtinctions do any more then keep them from ſeeming to contradict themſelves in words, whilſt Unprepoſſeſs'd perſons ſee that they do it in effect. Nor could I ever find it intelligibly made out, what theſe real Qualities may be, that they deny to be either Matter or modes of Matter, or immaterial Subſtances. When a Bowl runs along or lies ſtill, that *Motion* or *Reſt*, or *Globous figure* of the Bowl, is not *Nothing*, and yet it is not any *part* of the Bowl; whoſe whole Subſtance would remain, though it wanted which you pleaſe of theſe Accidents: and to make them *real* and *phyſical* Entities, (for we have not here to do either with *Logical* or *Metaphyſical* ones) is, as if, becauſe we may conſider the ſame Man ſitting, ſtanding, running, thirſty, hungrie, wearie, &c. we ſhould make each of theſe a diſtinct Entitie, as we do give ſome of them (as hunger, weárineſs, &c.)

diſtinct names. Whereas the ſubject of all theſe Qualities is but the ſame Man as he is conſidered with Circumſtances, that make him appear different in one caſe from what he appears in another: And it may be very uſeful to our preſent Scope to obſerve, that not onely diverſity of *Names*, but even diverſity of *Definitions*, doth not alwaies infer a diverſity of *Phyſical Entities* in the Subject, whereunto they are attributed. For it happens in many of the Phyſical Attributes of a Body, as in thoſe Other caſes, wherein a Man that is a Father, a Husband, a Maſter, a Prince, &c. may have a Peculiar Definition (ſuch as the Nature of the thing will bear) belong unto him in each of theſe Capacities, and yet the Man in himſelf conſidered is but the ſame Man, who in reſpect of differing Capacities or Relations to other things is call'd by differing Names, and deſcrib'd by various Definitions, which yet (as I was ſaying) conclude not ſo many real and diſtinct Entities in the perſon ſo variouſly denominated.

An
EXCURSION
about the Relative Nature *of* Phyſical Qualities.

But becauſe I take this Notion to be of no Small Importance towards the Avoiding of the Grand Miſtake, that hath hitherto obtain'd about the Nature of Qualities, it will be worth while to Illuſtrate it a little farther. We may conſider then, that when *Tubal-Cain*, or whoever elſe were the Smith, that Invented *Locks* and *Keyes*, had made his firſt Lock, (for we may Reaſonably ſuppoſe him to have made that before the *Key*, though the Compariſon may be made uſe of without that Suppoſition,) That was onely a Piece of Iron, contriv'd into ſuch a Shape; and when afterwards he made a Key to that Lock, That alſo in it ſelf Conſider'd, was nothing but a Piece of Iron of ſuch a Determinate Figure: but in Regard that theſe two Pieces of Iron might now be Applied to one another after a Certain manner, and that there was a Congruitie betwixt the Wards of the Lock and thoſe of the Key, the Lock and the Key did each of them now Obtain a new Capacity, and it became a Main part of the Notion and Deſcription of a Lock, that it was capable of being made to Lock or Unlock by that other Piece of Iron we call a Key, and it was Lookd upon as a Peculiar Faculty and Power in the Key, that it was Fitted to Open and Shut the Lock, and yet by theſe new Attributes there was not added any Real or Phyſical Entity, either to the Lock, or to the

Key, each of them remaining indeed nothing, but the ſame Piece of Iron, juſt ſo Shap'd as it was before. And when our Smith made other Keyes of differing Bigneſſes, or with Differing Wards, though the firſt Lock was not to be open'd by any of thoſe Keyes, yet that Indiſpoſition, however it might be Conſider'd as a peculiar Power of Reſiſting this or that Key, and might ſerve to Diſcriminate it ſufficiently from the Locks thoſe Keyes belong'd to, was nothing new in the Lock, or diſtinct from the Figure it had before thoſe Keyes were made. To carrie this Compariſon a little Further, let me adde, that though one that would have Defin'd the Firſt Lock, and the Firſt Key, would have Given them diſtinct Definitions with Reference to each other; and yet (as I was ſaying) theſe Definitions being given but upon the Score of Certain Reſpects, which the Defin'd Bodies had One to Another, would not infer, that theſe two Iron Inſtruments did Phyſically differ otherwiſe then in the Figure, Size, or Contrivement of the Iron, whereof each of them conſiſted. And proportionably hereunto I do not ſee, why we may not conceive, That as to thoſe Qualities (for Inſtance) which we call Senſible, though by virtue of a certain Congruity or Incongruity in point of Figure or Texture, (or other Mechanical Attributes,) to our Senſories, the Portions of Matter they Modifie are enabled to produce various Effects, upon whoſe account we make Bodies to be Endow'd with Qualities; yet They are not in the Bodies that are Endow'd with them any Real or Diſtinct Entities, or differing from the Matter its ſelf, furniſh'd with ſuch a Determinate Bigneſs, Shape, or other Mechanical Modifications. Thus though the modern Gold-Smiths and Refiners reckon amongſt the moſt diſtinguiſhing Qualities of Gold, by which men may be certain of its being True, and not Sophiſticated, that is eaſily diſſoluble in *Aqua Regis*, and that *Aqua Fortis* will not work upon it; yet theſe Attributes are not in the Gold any thing diſtinct from its peculiar Texture, nor is the Gold we have now of any other Nature, then it was in *Pliny*'s time, when *Aqua Fortis* and *Aqua Regis* had not been Found out, (at leaſt in theſe parts of the World,) and were utterly unknown to the Roman Gold-Smiths. And this Example I have the rather pitch'd upon, becauſe it affords me an Opportunity to repreſent, that, unleſs we admit the Doctrine I have been Propoſing, we muſt Admit, that a Body may have an almoſt Infinite Number of New Real Entities accruing to it, without the Intervention of any Phyſical Change in the Body its ſelf. As for Example, Gold was the ſame Natural Body immediately before *Aqua Regis* and *Aqua Fortis* were firſt made, as it was immediately after, and yet now 'tis reckon'd amongſt its Principal Properties, that it is diſſoluble by the Former of thoſe two Menſtruums, and that it is not like other Mettals Diſſoluble or Corrodible by the Latter. And if one ſhould Invent another Menſtruum, (as poſſibly I may Think my ſelf Maſter of ſuch a one) that will but in part diſſolve pure Gold, and change ſome part of it into another Metalline Body, there will then ariſe another new Property, whereby to diſtinguiſh That from other Mettals; and yet the Nature of Gold is not a whit other now, then it was before this laſt Menſtruum was firſt made. There are ſome Bodies not Cathartick, nor Sudorifick, with ſome of which Gold being joyn'd acquires a Purgative Vertue, and with others a power to procure Sweat; and in a word, Nature her ſelf doth, ſometimes otherwiſe, and ſometimes by Chance, produce ſo many things, that have new Relations unto o-

thers:

BIBLIOTECA NAZ. ROMA VITTORIO EMANUELE

thers: And Art, eſpecially aſſiſted by Chymiſtry, may, by variouſly diſſipating Natural Bodies, or Compounding either them, or their Conſtituent Parts with one another, make ſuch an Innumerable Company of new Productions, that will each of Them have new operations, either immediately upon our Senſories, or upon other Bodies, whoſe Changes we are able to perceive, that no man can know, but that the moſt Familiar Bodies may have Multitudes of Qualities, that he dreams not of, and a Conſidering man will hardly imagine, that ſo numerous a Croud of real Phyſical Entities can accrue to a Body, whilſt in the Judgment of all our Senſes it remains Unchang'd, and the Same that 'twas before.

To clear this a little farther, we may adde, that beaten Glaſs is commonly reckon'd among Poiſons; and (to skip what is mention'd out of *Sanctorius*, of the Dyſentery procur'd by the Fragments

ments of it) I remember ***Cardan* hath a ſtory, That in a Cloiſter, where he had a Patient then like to die of torments in the Stomach, two other Nuns had been already kill'd by a diſtracted Woman, that having Caſually got Free, had mixt beaten Glaſs with Peaſe, that were eaten by theſe three, and diverſe others of the Siſters (who yet eſcap'd unharm'd.) Now though the powers of Poiſons be not onely look'd upon as *real* Qualities, but are reckoned among the *Abſtruſeſt* ones: yet this Deleterious Faculty, which is ſuppos'd to be a Peculiar and Superadded Entitie in the beaten Glaſſe, is really nothing diſtinct from the Glaſs its ſelf, (which though a Concrete made up of thoſe Innocent Ingredients, Salt and Aſhes, is yet a hard and ſtiffe Body,) as it is furniſh'd with that determinate Bigneſs, and Figure of Parts, which have been acquir'd by Comminution. For theſe Glaſſy Fragments being many, and Rigid, and ſomewhat Small, (without yet being ſo ſmall as Duſt,) and endow'd with ſharp Points and cutting Edges, are enabled by theſe Mechanical Affections to Pierce or Wound the tender Membranes of the Stomach and Guts, and cut the ſlender Veſſels that they meet with there, whereby naturally enſue great Gripings and Contorſions of the injur'd Parts, and oftentimes Bloudy Fluxes occaſion'd by the perforation of the Capillary Arteries, and the great irritation of the Expulſive Faculty, and ſometimes alſo not onely horrid Convulſions by Conſent of the Brain and Cerebellum, with ſome of the Nervous or Membranous parts that happen to be hurt, but alſo Dropſies occaſioned by the great loſs of Bloud we were juſt now ſpeaking of. And it agrees very well with this Conjecture, that beaten Glaſs hath diverſe times been obſerv'd to have done no Miſchief to Animals that have ſwallowed it: For there is no Reaſon it ſhould, in caſe the Corpuſcles of the Powder either chance to be ſo ſmall, as not to be fit to wound the Guts, which are uſually lin'd with a ſlimy ſubſtance, wherein very minute Powders may be as it vvere ſheath'd, and by that means hinder'd from hurting the Guts, (inſomuch that a fragment of Glaſs vvith three very ſharp corners, hath been obſerv'd to have for above eighteen Months lain * inoffenſive even in a nervous and very ſenſible part of the body,) out of vvhich they may with the groſſer Excrements of the Lower Belly be harmeleſly Excluded,

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* *Cardan: Contradict. 9. lib. 2. Tract. 5. apud Schenckium.*

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* This memorable Accident happen'd to a Senator of *Berne*, who was cur'd by the Experienc'd *Fabricius Hildanus*, that gives a long Account of it to the Learned *Horſtius*, among whoſe Obſervations tis extant: (*Lib.* 2. *obſerv.* 35.) who aſcribes the Indolence of the Part, whilſt uncompreſs'd, to ſome ſlimy Juice, (familiar enough to thoſe Tendinous parts,) wherein the Glaſſy fragment was as it were Bedded.

eſpecially in ſome Individuals; whoſe Guts and Stomach too may be of a much ſtronger Texture, and better Lin'd or Stuff'd with Groſs and Slimy Matter, then thoſe of others. And accordingly we ſee, that the Fragments of Saphires, Chriſtals, and ev'n Rubies, which are much harder then Glaſs; are innocently, though perhaps not very effectually us'd by Phyſicians, (and I have ſeveral times taken That without Inconvenience) in Cordial Compoſitions, becauſe of their being by Grinding reduc'd to a Powder too Subtle to Excoriate, or Grate upon the Stomach, or Guts; and probably 'twas upon ſome ſuch Account, that That happen'd which is related by *Cardan* in the ſame place, namely, That though the three Nuns we have been ſpeaking of were Poiſon'd by the Glaſs, yet many others who eat of the other Portions of the ſame mingled Peaſe, receiv'd no miſchief thereby. (But of this ſubject more † elſewhere.)

And this puts me in mind to adde, That the Multiplicity of Qualities, that are ſometimes to be met with in the ſame Natural Bodies, needs not make men reject the Opinion we have been propoſing, by perſwading them, that ſo many Differing Attributes, as may be ſometimes found in one and the ſame Natural Body, cannot proceed from the bare Texture, and other Mechanical Affections of its Matter. For we muſt conſider each Body, not barely as it is in it ſelf an entire and diſtinct portion of Matter, but as it is a Part of the Univerſe, and conſequently plac'd among a great Number and Variety of other Bodies, upon which it may Act, and by which it may be acted on, in many waies, (or upon many Accounts,) each of which Men are wont to Fancy, as a diſtinct Power or Quality in the Body, by which thoſe Actions, or in which thoſe Paſſions are produc'd. For if we thus conſider Things, we ſhall not much wonder, that a Portion of Matter, that is indeed endow'd but with a very few Mechanical Affections, as ſuch a determinate Texture and Motion, but is plac'd among a multitude of other Bodies, that differ in thoſe Attributes from it, and one another, ſhould be capable of having a great Number and Variety of Relations to thoſe other Bodies, and conſequently ſhould be thought to have many Diſtinct Inhærent Qualities, by ſuch as look upon thoſe ſeveral Relations or Reſpects it may have to Bodies without it, as Real and Diſtinct Entities implanted in the Body it ſelf. When a Curious Watch is going, though the Spring be that which puts all the Parts into Motion, yet we do not Fancie (as an *Indian* or *Chinois* would perchance do) in this

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† In thoſe Notes about Occult Qualities, where the Deleterious Faculty attributed to Diamonds is conſidered.

Spring one Faculty to move the Index uniformely round the Dial-plate, another to ſtrike the Hour, and perhaps a Third to give an Alarme, or ſhew the Age of the Moon, or the Tides; all the action of the Spring, (which is but a flexible piece of Steel, forcibly coil'd together,) being but an Endeavour to dilate or unbind its ſelf, and the reſt being perform'd by the various Reſpects it hath to the ſeveral Bodies (that compoſe the Watch) among which it is plac'd, and which they have One to another. We all know, that the Sun hath a power to Harden Clay, and Soften Wax, and Melt Butter, and Thaw Ice, and turn Water into Vapours, and make Air expand it ſelf in Weather-Glaſſes, and contribute to Blanch Linnen, and make the White skin of the Face Swarthy, and Mowed Graſs Yellow, and ripen Fruit, hatch the Eggs of Silk-worms, Caterpillars, and the like Inſects, and perform I know not how many other things, divers of which ſeem contrary Effects, and yet theſe are not diſtinct Powers or Faculties in the Sun, but onely the Productions of its Heat, (which it ſelf is but the briſk, and confuſ'd Local Motion of the Minute parts of a Body,) diverſify'd by the differing Textures of the Body that it chances to work upon, and the Condition of the other Bodies that are concern'd in the Operation. And therefore whether the Sun in ſome caſes have any Influence at all diſtinct from its Light and Heat, we ſee, that all thoſe *Phænomena* we have thought fit to name are producible by the heat of the common Culinary Fire duly apply'd and regulated. And ſo, to give an *Inſtance* of another Kind, when ſome years ſince, to Try ſome Experiments about the Propagation of Motion, with Bodies leſs capable of being batter'd by one another, then thoſe that have been formerly imploy'd; I caus'd ſome ſolid Bals of Iron ſkilfully harden'd, and exquiſitely ſhap'd and glaz'd, to be purpoſely made; each of theſe poliſhed Balls was a Sphærical Looking-Glaſs, which plac'd in the mid'ſt of a Room, would exhibit the Images of the Objects round about it, in a very regular and pleaſing Perſpective. It would Contract the Image, and Reflect the Beams of the Sun, after a manner differing from Flat and from Convex Looking Glaſſes. It would in a neat Perſpective leſſen the Image of him that look'd upon it; and bend it, and it would ſhew that Image, as if it were behind the Surface, and within the ſolid ſubſtance of the Sphære, and in ſome it had all thoſe Diſtinct, and ſome of them wonderful Properties, which either Antient or Modern Writers of Catoptricks have demonſtrated to belong to Sphærical *Specula*, as ſuch: and yet the Globe furniſh'd with all theſe Properties and Affections, was but the Iron it ſelf reduc'd by the Artificer to a Sphærical Figure, (for the Glaſs, that made it Specular, was not diſtinct from the Superficial parts of the Iron, reduc'd all of them to a Phyſically equal diſtance from the Center.) And of *ſpecula*, Sphærical enough as to ſenſe, you may make ſtore in a trice, by breaking a large Drop of Quick-ſilver into ſeveral little ones, each of which will ſerve for Objects plac'd pretty near it, and the ſmaller of which (being the leaſt depreſs'd in the middle by their own weight, and conſequently more perfectly Globous,) may with a good Microſcope plac'd in a Window afford you no unpleaſant proſpect of the neighbouring Objects, and yet to reduce a parcel of Stagnant Quickſilver, which will much æmulate a Flat Looking-Glaſs, into many of theſe little Sphærical *Specula*, whoſe Properties are ſo differing from thoſe of Plain ones, there intervenes nothing but a ſleight Local Motion, which in the twinckling of an

Eye changeth the Figure of the ſelf ſame Matter.

I have ſaid thus much (*Pyrophilus*) to remove the Miſtake, That *every thing men are wont to call a Quality*, muſt needs be a Real and Phyſical Entity, becauſe of the Importance of the Subject; and yet I have omitted ſome things that might have been pertinently added, partly becauſe I may hereafter have Opportunity to take them in, and partly becauſe I would not any farther lengthen this Excurſion, which yet I muſt not Conclude, till I have added this ſhort Advertiſement.

That I have choſen to Declare what I mean by Qualities, rather by Examples, then Definitions, *partly* becauſe being immediately or reductively the Objects of ſenſe, Men generally underſtand pretty well what one another mean, when they are ſpoken of: (As to ſay, that the Taſt of ſuch a thing is Saline or Sowr, or that ſuch a Sound is

Melodious, Shrill, or Jarring, (eſpecially if when we ſpeak of Senſible Qualities, we adde ſome Enumeration of particular Subjects, wherein they do the moſt Eminently reſide,) will make a Man as ſoon underſtood, as if he ſhould go about to give Logical Definitions of thoſe Qualities:) and *partly* becauſe the Notions of things are not yet ſo well ſtated, and agreed on, but that it is many times difficult to Aſſign their true *Genus's*: and *Ariſtotle* himſelf doth not onely define *Accidents* without ſetting down their *Genus*, but when he comes to define *Qualities*, he tels us, that *Quality is that by which a thing is ſaid to be Qualis*, where I would have you take notice both, that in his Definition he omits the *Genus*, and that 'tis no ſuch eaſy Thing to give a very good Definition of Qualities, ſince he that is reputed the great Maſter of Logick, where he pretends to give us one, doth but upon the matter define the thing by the ſame thing,

thing; for 'tis ſuppoſ'd to be as little known what *Qualis* is, as what *Qualitas* is, and me thinks he does juſt as if I ſhould define Whiteneſs to be that, for which a thing is called White, or Vertue, that for which a Man is ſaid to be Vertuous †. Beſides that, I much doubt, whether his Definition be not Untrue as well as Obſcure, for to the Queſtion, *Qualis res eſt?* Anſwer may be return'd out of *ſome*, if not *all* of the other *Prædicaments of Accidents*: which ſome of the Modern Logicians being aware of, they have endeavoured to ſalve the matter with certain Cautions and Limitations, which however they may argue the Deviſors to be ingenious, do, for ought I can diſcern, leave us ſtill to ſeek for a right and intelligible Definition of Quality in general, though to give ſuch a one be probably a much eaſier Task, then to define many Qualities, that may be nam'd in particular, as Saltneſs, Sowrneſs, Green, Blew, and many others, which when we hear nam'd, every man knows what is meant by them, though no man (that I know of) hath been able to give accurate Definitions of them.

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† Since the writing of this, the Author found, that ſome of the Eminenteſt of the modern Schoolmen themſelves, have been, as well as he, unſatisfied with the Ariſtotelian Definition of Quality: concerning which (not to mention *Revius*, a Learned Proteſtant Annotator upon *Suarez*.) *Ariaga* ſayes (*diſp. 5. ſect. 2. ſubſ. 1.*) *Per hanc nihil explicatur; nam de hoc quærimus, quid ſit eſſe qual., dices habere qualitatem; bonus Circulus: qualitas eſt id quo quis ſit qualis, & eſſe qualem eſt habere Qualitatem.* And even the famous Jeſuit *Suarez*, though he endeavours to excuſe it, yet confeſſeth, that it leaves the proper Notion of Quality as obſcure to us as before: (*Quæ definitio*, ſaith he, *licèt ea ratione eſſentialis videatur, quod detur per habitudinem ad effectum formalem, quem omnis Forma eſſentialiter reſpicit, tamen quod ad nos ſpectat, æquè obſcura nobis manet propria ratio Qualitatis.*) *Suarez Diſputat. Metaphyſic.* 42. But *Hurtadus* (in his Metaphyſical Diſputations) ſpeaks more boldly, telling us roundly, that it is *Non tam Definitio, quàm inanis quædam Nugatio*, which makes me the more wonder, that a famous Carteſian (whom I forbear to name) ſhould content himſelf to give us ſuch an Inſignificant, or at leaſt Superficial Definition of Quality.

IV. And if we ſhould conceive, that

all the reſt of the Univerſe were annihilated, except any of theſe entire and undivided Corpuſcles, (treated of in the 3^d^ Particular foregoing,) it is hard to ſay what could be attributed to it, beſides Matter, Motion (or Reſt,) Bulk, and Shape, (whence by the way you may take notice, that Bulk, though uſually taken in a Comparative ſenſe, is in our ſenſe an abſolute Thing, ſince a Body would have it, though there were no other in the World.) But now there being actually in the Univerſe great Multitudes of Corpuſcles mingled among themſelves, there ariſe in any diſtinct portion of Matter, which a number of them make up, two new Accidents or Events: the one doth more relate to each particular Corpuſcle in reference to the (really or ſuppoſedly) ſtable Bodies about it, namely its *Poſture*; (whether Erected, Inclin'd, or Horizontal:) And, when two or more of ſuch Bodies are plac'd one by

another,

another, the manner of their being ſo plac'd, as one beſides another, or one behind another, may be call'd their *Order*; as I remember, *Ariſtotle* in his Metaphyſicks, *lib.* 1.*cap.* 4. recites this Example out of the antient Corpuſcularians, That *A and N differ in Figure, and A N and N A in Order, Z and N in Scituation*: and indeed Poſture and Order ſeem both of them reducible to Scituation. And when many Corpuſcles do ſo convene together as to compoſe any diſtinct Body, as a Stone, or a Mettal, then from their other Accidents (or Modes,) and from theſe two laſt mention'd, there doth emerge a certain Diſpoſition or Contrivance of Parts in the whole, which we may call the *Texture* of it.

V. And if we ſhould conceive all the reſt of the Univerſe to be annihilated, ſave one ſuch Body, ſuppoſe a Mettal or a Stone, it were hard to ſhew, that there is Phyſically any thing more in it then Matter, and the Accidents we have already named. But now we are to conſider, that there are *de facto* in the world certain ſenſible and rational Beings, that we call Men, and the body of Man having ſeveral of its external parts, as the Eye, the Ear, &c. each of a diſtinct and peculiar Texture, whereby it is capable to receive Impreſſions from the Bodies about it, and upon that account it is call'd an Organ of Senſe, we muſt conſider, I ſay, that theſe Senſories may be wrought upon by the Figure, Shape, Motion, and Texture of Bodies without them, after ſeveral waies, ſome of thoſe External Bodies being fitted to affect the Eye, others the Ear, others the Noſtrils, &c. And to theſe Operations of the Objects on the Senſories, the Mind of Man, which upon the account of its Union with the Body perceives them, giveth diſtinct Names, calling the one Light or Colour, the other Sound, the other Odour,

&c. And becauſe alſo each Organ of Senſe, as the Eye, or the Palat, may be it ſelf differingly affected by External Objects, the Mind likewiſe gives the Objects of the ſame Senſe diſtinct Appellations, calling one colour Green, the other Blew, and one taſt Sweet, and another Bitter, &c. Whence Men have been induc'd to frame a long Catalogue of ſuch Things as, for their relating to our Senſes, we call Senſible Qualities; and becauſe we have been converſant with them, before we had the uſe of Reaſon, and the Mind of Man is prone to conceive almoſt every Thing (nay even Privations, as Blindneſs, Death, &c.) under the notion of a true Entitie or Subſtance as it ſelf is; we have been from our Infancy apt to imagine, that theſe Senſible Qualities are Real Beings, in the Objects they denominate, and have the faculty or power to work ſuch and ſuch things; as Gravity hath a power to ſtop the motion of a Bullet ſhot

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ſhot upwards, and carry that ſolid Globe of Matter toward the Center of the Earth, whereas indeed (according to what we have largely ſhewn above) there is in the Body, to which theſe Senſible Qualities are attributed, nothing of Real and Phyſical, but the Size, Shape, and Motion, or Reſt of its component Particles, together with that Texture of the whole, which reſults from their being ſo contriv'd as they are; nor is it neceſſary they ſhould have in them any thing more, like to the Ideas they occaſion in us, thoſe Ideas being *either* the Effects of our Præjudices, or Inconſideratenefs, *or* elſe to be fetcht from the Relation, that happens to be betwixt thoſe Primary Accidents of the Senſible Object, and the peculiar Texture of the Organ it affects; as when a Pin, being run into my Finger, cauſeth pain, there is no diſtinct Quality in the Pin anſwerable to what I am apt to fancie Pain to be, but the Pin in it ſelf is onely ſlender, ſtiff, and ſharp, and by thoſe qualities happens to make a Solution of Continuity in my Organ of Touching, upon which, by reaſon of the Fabrick of the Body, and the intimate Union of the Soul with it, there ariſeth that troubleſome kind of Perception, which we call Pain, and I ſhall anon more particularly ſhew, how much that depends upon the peculiar fabrick of the Body.

VI. But here I foreſee a Difficulty, which being perhaps the chiefeſt, that we ſhall meet with againſt the Corpuſcular Hypotheſis, it will deſerve to be, before we proceed any farther, taken notice of. And it is this, that, whereas we explicate Colours, Odours, and the like ſenſible Qualities by a *relation to our Senſes*, it ſeems evident, that they have an *abſolute* Being irrelative to *Us*; for, Snow (for inſtance) would be white, and a glowing Coal would be hot, though there were no Man or any other

Animal in the World: and 'tis plain, that Bodies do not onely by their Qualities work upon *Our ſenſes*, but upon *other*, and thoſe, Inanimate *Bodies*; as the Coal will not onely heat or burn a *Man's hand* if he touch it, but would likewiſe heat Wax, (even ſo much as to melt it, and make it flow,) and thaw Ice into Water, though all the Men, and ſenſitive Beings in the World were annihilated. To clear this Difficulty, I have ſeveral things to repreſent, and,

1. I ſay not, that there are no other Accidents in Bodies then Colours, Odours, and the like; for I have already taught, that there are ſimpler and more Primitive Affections of Matter, from which theſe Secondary Qualities, if I may ſo call them, do depend: and that the Operations of Bodies upon one another ſpring from the ſame, we ſhall ſee by and by.

2. Nor do I ſay, that all Qualities of Bodies are *directly Senſible*; but I obſerve,

ſerve, that when one Body works upon another, the knowledg we have of their Operation, proceeds, either from ſome ſenſible Quality, or ſome more Catholick affection of Matter, as Motion, Reſt, or Texture, generated or deſtroy'd in one of them; for elſe it is hard to conceive, how we ſhould come to diſcover what paſſes betwixt them.

3. We muſt not look upon every diſtinct Body, that works upon our Senſes, as a bare lump of Matter of that bigneſs and outward ſhape, that it appears of; many of them having their parts curiouſly contriv'd, and moſt of them perhaps in motion too. Nor muſt we look upon the Univerſe that ſurrounds us, as upon a moveleſs and undiſtinguiſh'd Heap of Matter, but as upon a great Engine, which, having either no Vacuity, or none that is conſiderable, betwixt its parts (known to us,) the actions of particular Bodies upon one another muſt not be barely æſti-

mated, as if two Portions of Matter of their Bulk and Figure were plac'd in ſome imaginary Space beyond the World, but as being ſcituated in the World, conſtituted as it now is, and conſequently as having their action upon each other liable to be promoted, or hindred, or modify'd by the Actions of other Bodies beſides them: as in a Clock, a ſmall force apply'd to move the Index to the Figure of 12, will make the Hammer ſtrike often and forcibly againſt the Bell, and will make a far greater Commotion among the Wheels and Weights, then a far greater force would do, if the Texture and Contrivance of the Clock did not abundantly contribute to the Production of ſo great an Effect. And in agitating Water into Froth, the Whiteneſs would never be produc'd by that Motion, were it not that the Sun, or other Lucid Body, ſhining upon that Aggregate of ſmall Bubbles, enables them to reflect confuſedly great ſtore of little, and as it were contiguous lucid images to the Eye. And ſo the giving to a large Metalline Speculum a Concave figure, would never enable it to ſet Wood on fire, and even to melt down Mettals readily, if the Sun beams, that in Cloudleſs dayes do, as to ſenſe, fill the Air, were not by the help of that Concavity, thrown together to a Point. And to ſhew You by an eminent Inſtance, how various and how differing Effects the Same action of a Natural Agent may produce, according to the ſeveral Diſpoſitions of the Bodies it works upon, do but conſider, that in two Eggs, the one Prolifick, the other Barren, the ſenſe can perhaps diſtinguiſh before Incubation no difference at all; and yet theſe Bodies, outwardly ſo like, do ſo differ in the internal diſpoſition of their parts, that if they be both expoſ'd to the ſame degree of Heat, (whether of a Hen, or an Artificial Oven,) that Heat will change the one into a putrid and ſtinking Subſtance, and the other into a Chick, furniſh'd with great variety of Organical parts of very differing conſiſtences, and curious as well as differing Textures.

4. I do not deny, but that Bodies may be ſaid, in a very favourable ſenſe, to have thoſe Qualities we call Senſible, though there were no Animals in the World: for a Body in that caſe may differ from thoſe Bodies, which now are quite devoid of Quality, in its having ſuch a diſpoſition of its Conſtituent Corpuſcles, that in caſe it were duely apply'd to the Senſory of an Animal, it would produce ſuch a ſenſible Quality, which a Body of another Texture would not; as though if there were no Animals, there would be no ſuch thing as Pain, yet a Pin may upon the account of its Figure be fitted to cauſe pain, in caſe it were mov'd againſt a Man's finger, whereas a Bullet, or other blunt Body mov'd againſt it with no greater

force, will not cauſe any ſuch perception of pain. And thus Snow, though if there were no Lucid Body nor Organ of Sight in the World, it would exhibit no Colour at all, (for I could not find it had any in places exactly darkned,) yet it hath a greater diſpoſition then a Coal or Soot to reflect ſtore of Light outwards, when the Sun ſhines upon them all three. And ſo we ſay, that a Lute is in tune, whether it be actually plaid upon or no, if the Strings be all ſo duly ſtretcht, as that it would appear to be in Tune, if it were play'd upon. But as if You ſhould thruſt a Pin into a man's Finger, both a while before and after his Death, though the Pin be as ſharp at one time as at another, and maketh in both caſes alike a Solution of Continuity; yet in the former caſe, the Action of the Pin will produce Pain, and not in the latter, becauſe in this the prick'd Body wants the Soule, and conſequently the Perceptive Faculty: ſo if there were no Senſitive Beings, thoſe Bodies that are now the Objects of our Senſes, would be but *diſpoſitively*, if I may ſo ſpeak, endow'd with Colours, Taſts, and the like; and *actually* but onely with thoſe more Catholick Affections of Bodies, Figure, Motion, Texture, &c.

To illuſtrate this yet a little farther, ſuppoſe a Man ſhould beat a Drum at ſome diſtance from the mouth of a Cave, conveniently ſcituated to return the Noiſe he makes; although Men will preſently conclude, that That Cave hath an Echo, and will be apt to fancy upon that account ſome Real Property in the place, to which the Echo is ſaid to belong, and although indeed the ſame Noiſe made in many other of the neighbouring places, would not be reflected to the Eare, and conſequently would manifeſt thoſe places to have no Echos; yet to ſpeak Phyſically of things, this Peculiar Quality or Property we fancy in the Cave, is in It nothing elſe but the Hollowneſs of its Figure, whereby 'tis ſo diſpoſ'd, as when the Air beats againſt it, to reflect the Motion towards the place whence that Motion began; and that which paſſeth on this occaſion is indeed but this, That the Drum ſtick falling upon the Drum, makes a Percuſſion of the Air, and puts that Fluid Body into an Undulating Motion, and the Aery Waves thruſting on one another, 'till they arrive at the hollow Superficies of the Cave, have by reaſon of its reſiſtance and figure, their Motion determin'd the contrary way, namely backwards towards that part where the Drum was, vvhen it vvas ſtruck; ſo that in That, vvhich here happens, there intervenes nothing but the Figure of one Body, and the Motion of another, though if a Man's Ear chance to be in the way of theſe Motions of the Air forwards and backvvards, it gives him a Perception of them, which he calls Sound; and becauſe theſe Perceptions, which are ſuppos'd to proceed from the ſame percuſſion of the Drum, and thereby of the Air, are made at diſtinct times one after another, That hollow Body, from whence the Laſt Sound is conceiv'd to come to the Air, is imagin'd to have a peculiar Faculty, upon whoſe account Men are wont to ſay, that ſuch a place hath an Echo.

5. And whereas one Body doth often ſeem to produce in another divers ſuch Qualities, as we call Senſible, which Qualities therefore ſeem not to need any reference to our Senſes, I conſider, that when one Inanimate Body works upon another, there is nothing really produc'd by the Agent in the Patient, ſave ſome Local Motion of its Parts, or ſome Change of Texture conſequent upon that Motion; and ſo, if the Patient come to have any ſenſible Quality, that it had not before, it acquires it up-

on the ſame account, upon which other Bodies have it, and it is but a conſequent to this Mechanical Change of Texture, that by means of its Effects upon our Organs of Senſe, we are induc'd to attribute this or that ſenſible Quality to it. *As* in caſe a Pin ſhould chance by ſome inanimate Body to be driven againſt a Man's Finger, that which the Agent doth, is but to put a ſharp and ſlender Body into ſuch a kind of Motion, and that which the Pin doth, is to pierce into a Body that it meets with, not hard enough to reſiſt its Motion, and ſo that upon this there ſhould enſue ſuch a thing as Pain, is but a Conſequent, that ſuperadds nothing of Real to the Pin that occaſions that Pain. *So* if a piece of Tranſparent Ice be, by the falling of ſome heavy and hard Body upon it, broken into a Groſs Powder that looks Whitiſh, the falling Body doth nothing to the Ice but break it into very ſmall Fragments, lying confuſedly upon one another,

another; though by reaſon of the Fabrick of the World, and of our Eyes, there doth in the day time upon this Comminution, enſue ſuch a kind of copious Reflection of the incident Light to our Eyes, as we call Whiteneſſe: and when the Sun, by thawing this broken Ice, deſtroyes the Whiteneſs of that portion of Matter,and makes it become Diaphanous, which it was not before, it doth no more then alter the Texture of the Component parts, by putting them into Motion, and thereby into a new Order; in which, by reaſon of the diſpoſition of the Pores intercepted betwixt them, they reflect but few of the incident beams of Light, and tranſmit moſt of them. Thus when with a Burniſher You poliſh a rough piece of Silver, that which is really done,is but the Depreſſion of the little Protuberant parts into one Level with the reſt of the Superficies; though upon this Mechanical change of the Texture of the

Superficial parts, we Men ſay, that it hath loſt the Quality of Roughneſs, and acquir'd that of Smoothneſs, becauſe that whereas before, the little Exſtancies by their Figure reſiſted a little the Motion of our Finger, and grated upon them a little, our Fingers now meet with no ſuch offenſive Reſiſtance. 'Tis true that the Fire doth thaw Ice, and alſo both make Wax flow, and enable it to burn a Man's hand, and yet this doth not neceſſarily argue in it any Inhærent Quality of Heat, diſtinct from the Power it hath of putting the ſmall parts of the Wax into ſuch a Motion, as that their Agitation ſurmounts their Cohæſion; which Motion, together with their Gravity, is enough to make them *pro tempore* conſtitute a Fluid Body: and *Aqua Fortis*, without any (ſenſible) Heat, will make Camphire, caſt on it, aſſume the form of a Liquor diſtinct from it; as I have try'd, that a ſtrong Fire will alſo make Camphire fluid: not to adde, that I know a Liquor, into which certain Bodies being put, when both it Self, (as well as They,) is *actually cold*, (and conſequently when You would not ſuſpect it of an Actual Inhærent Heat) will not onely ſpeedily diſſipate many of their parts into Smoak, but leave the reſt Black, and burnt almoſt like a Coal. So that though we ſuppoſe the Fire to do no more then variouſly and briskly to agitate the Inſenſible parts of the Wax, That may ſuffice to make us think the Wax endow'd with a Quality of Heat: becauſe if ſuch an Agitation be greater then that of the Spirit, and other parts of our Organs of Touching, That is enough to produce in us that Senſation we call Heat; which is ſo much a Relative to the Senſory which apprehends it, that vve ſee, that the ſame Lukevvarm Water, that is, vvhoſe Corpuſcles are moderately agitated by the Fire, will appear hot to one of a Man's hands, if That be very cold; and cold to the other, in caſe it be very hot, though both of them be the ſame Man's hands. To be ſhort, if we fancy any two of the Bodies about us, as a Stone, a Mettal, &c. to have nothing at all to do with any other Body in the Univerſe, 'tis not eaſy to conceive, either how one can act upon the other, but by Local Motion (of the whole Body, or its Corporeal Effluvia;) or how by Motion it can do any more, then put the Parts of the other Body into Motion too, and thereby produce in them a Change of Scituation and Texture, or of ſome other of its Mechanical Affections: though this (Paſſive) Body being plac'd among other Bodies in a World conſtituted as ours now is, and being brought to act upon the moſt curiouſly contriv'd Senſories of Animals, may upon both theſe accounts exhibit many differing ſenſible *Phænomena*; which however we look upon them as diſtinct Qualities, are conſequently but the Effects of the often mention'd Catholick affections of Matter, and deducible from the Size, Shape, Motion (or Reſt,) Poſture, Order, and the reſulting Texture of the Inſenſible parts of Bodies. And therefore though, for ſhortneſs of ſpeech, I ſhall not ſcruple to make uſe of the word *Qualities*, ſince it is already ſo generally receiv'd, yet I would be underſtood to mean them in a ſenſe ſuitable to the Doctrine above deliver'd. As if I ſhould ſay, that Roughneſſe is apt to grate and offend the Skin, I ſhould mean, that a File or other Body, by having upon its Surface a multitude of little hard and exſtant Parts, and of an Angular or ſharp Figure, is qualify'd to work the mention'd Effect: and ſo if I ſhould ſay, that Heat melts Mettals, I ſhould mean, that this Fuſion is effected by Fire, or ſome other Body, which by the various and vehement Motion of its inſenſible parts, does to us appear Hot. And hence,

(by

(by the way,) I preſume You will eaſily gueſs at what I think of the Controverſy ſo hotly diſputed of late betwixt two parties of Learned Men, whereof the One would have all Accidents to worke onely in virtue of the Matter they reſide in, and the Other would have the Matter to act onely in virtue of its Accidents: for conſidering, that on the one ſide, the Qualities, we here ſpeak of, do ſo depend upon Matter, that they cannot ſo much as have a Being but in, and by it; and on the other ſide, if all Matter were but quite devoid of Motion, (to name now no other Accidents,) I do not readily conceive, how it could operate at all, I think it is ſafeſt to conclude, That neither Matter, nor Qualities apart, but both of them conjointly do perform, what we ſee done by Bodies to one another, according to the Doctrine of Qualities juſt now deliver'd.

(*Of the Nature of a* Forme.)

VII. WE may now advance ſomewhat farther, and conſider, that Men having taken notice, that certain conſpicuous Accidents were to be found aſſociated in ſome Bodies, and other Conventions of Accidents in other Bodies, they did for conveniency, and for the more expeditious Expreſſion of their Conceptions agree to diſtinguiſh them into ſeveral Sorts, which they call *Genders* or *Species*, according as they referr'd them either upwards to a more Comprehenſive ſort of Bodies, or downward to a narrower Species, or to Individuals: As, obſerving many Bodies to agree in being Fuſible, Malleable, Heavy, and the like, they gave to that ſort of Body the name of *Mettal*, which is a *Genus* in reference to Gold, Silver, Lead, and but a *Species* in reference to that ſort of mixt Bodies they call *Foſsilia.* This *ſuperior Genus* comprehending both Mettals, Stones, and diverſe other Concretions, though it ſelf be but a *Species* in reſpect of Mixt Bodies. Now when any Body is referr'd to any particular *ſpecies*, (as of a Mettal, a Stone, or the like,) becauſe Men have for their Convenience agreed to ſignifie all the Eſſentials requiſite to conſtitute ſuch a Body by one Name, moſt of the Writers of Phyſicks have been apt to think, that beſides the common Matter of all Bodies, there is but One thing that diſcriminates it from other Kinds, and makes it what it is, and this for brevities ſake they call a *Forme*; which, becauſe all the Qualities and other Accidents of the Body muſt depend on it, they alſo imagine to be a very Subſtance, and indeed a kind of Soule, which united to the groſs Matter compoſes with it a Natural Body, and acts in it by the ſeveral Qualities to be found therein, which Men are wont to aſcribe to the Creature ſo compoſ'd. But as to this affair, I obſerve, that if (for Inſtance) You ask a Man, what Gold is, if he cannot ſhew you a piece of Gold, and tell You, This is Gold, he will deſcribe it to You as a Body, that is extremely Ponderous, very Malleable and Ductile, Fuſible and yet Fixt in the Fire, and of a Yellowiſh colour: and if You offer to put off to him a piece of Braſs for a piece of Gold, he will preſently refuſe it, and (if he underſtand Mettals) tell You, that though Your Braſs be coloured like it, 'tis not ſo heavy, nor ſo malleable, neither will it like Gold reſiſt the utmoſt brunt of the Fire, or reſiſt *Aqua Fortis*: and if You ask Men what they mean by a Ruby, or Niter, or a Pearl, they will ſtill make You ſuch Anſwers, that You may clearly perceive, that whatever Men talk in Theory of Subſtantial Forms, yet That, upon whoſe account they really diſtinguiſh any one Body from others, and refer it to this or that *Species* of Bodies, is nothing but an Aggregate or Convention of ſuch Accidents, as moſt men do by a kind of Agreement (for the Thing is more Arbitrary then we are aware of) think neceſſary or ſufficient to make a Portion of the Univerſal Matter belong to this or that Determinate *Genus* or *Species* of Natural Bodies. And therefore not onely the Generality of Chymiſts, but diverſe Philoſophers, and, what is more, ſome Schoolmen themſelves, maintain it to be poſſible to Tranſmute the ignobler Mettals into Gold; which argues, that if a Man could bring any Parcel of Matter to be Yellow, and Malleable, and Ponderous, and Fixt in the Fire, and upon the Teſt, and Indiſſoluble in *Aqua Fortis*, and in ſome to have a concurrence of all thoſe Accidents, by which Men try True Gold from Falſe, they would take it for True Gold without ſcruple. And in this caſe the generality of Mankind would leave the School-Doctors to diſpute, whether being a Factitious Body, (as made by the Chymiſts art,) it have the Subſtantial Form of Gold, and would upon the account of the Convention of the freſhly mention'd Accidents let it paſs Current amongſt them, notwithſtanding moſt Mens greater care, not to be deceived in a matter of this nature then in any other. And indeed, ſince to every Determinate *Species* of Bodies, there doth belong more then One Quality, and for the moſt part a concurrence of Many is ſo Eſſential to That ſort of Bodies, that the want of any of them is ſufficient to exclude it from belonging to that *Species*: there needs no more to diſcriminate ſufficiently any One kind of Bodies from all the Bodies in the World, that are not of that kind; as the Chymiſts *Luna fixa*, which they tell us wants not the Weight, the Malleableneſſe, nor the Fixtneſs, nor any other property of

Gold, except the Yellowneſſe, (which makes them call it White Gold,) would by reaſon of that want of Colour be eaſily known from true Gold. And you will not wonder at this, if you conſider, that thoſe Sphæres and Parallelopipedons differ but in Shape, yet this difference alone is the ground of ſo many others, that *Euclid* and other Geometricians have demonſtrated, I know not how many Properties of the one, which do no way belong to the other; and† *Ariſtotle* himſelf ſomewhere tels us, That a Sphære is compoſ'd of Braſs and Roundneſs. And I ſuppoſe it would be thought a Man's own fault, if he could not diſtinguiſh a Needle from a File, or a Key from a pair of Sciſſors, though theſe being all made of Iron, and differing but in Bigneſſe and Shape, are leſs remarkably diverſe then Natural Bodies, the moſt part of which differ from each other in far more Accidents then Two. Nor need we think that Qualities being but Accidents, they cannot be *eſſential* to a Natural Body; for Accident, as I formerly noted, is ſometimes oppoſ'd to Subſtance, and ſometimes to Eſſence: and though an Accident can be but accidental to Matter, as it is a Subſtantial thing, yet it may be eſſential to this or that particular Body; as in *Ariſtotle's* newly mention'd Example, though Roundneſs is but Accidental to Braſs, yet 'tis Eſſential to a Braſen Sphære; becauſe, though the Braſſe were devoid of Roundneſſe, (as if it were Cubical, or of any other figure,) it would ſtill be a Corporeal Subſtance, yet without that Roundneſs it could not be a Sphære: wherefore ſince an Aggregate or Convention of Qualities is enough to make the portion of Matter 'tis found in, what it is, and denominate it of this or that Determinate ſort of Bodies; and ſince thoſe Qualities, as we have ſeen already, do themſelves proceed from thoſe more Primary and Catholick affections of Matter, Bulk, Shape, Motion or Reſt, and the Texture thence reſulting, why may we not ſay, that the Form of a Body being made up of thoſe Qualities united in one Subject, doth likewiſe conſiſt in ſuch a Convention of thoſe newly nam'd Mechanical Affections of Matter, as is neceſſary to conſtitute a Body of that Determinate kind. And ſo, though I ſhall for brevities ſake retain the word *Forme*, yet I would be underſtood to mean by it, not a Real *Subſtance* diſtinct from Matter, but onely the Matter it ſelf of a Natural Body, conſider'd with its peculiar manner of Exiſtence, which I think may not inconveniently be call'd either its *Specifical* or its *Denominating State*, or its *Eſſential Modification*, or, if you would have me expreſs it in one word , its *Stamp*: for ſuch a Convention of Accidents is ſufficient to perform the Offices that are neceſſarily requir'd in what Men call a Forme, ſince it makes the Body ſuch as it is, making it appertain to this or that Determinate Species of Bodies, and diſcriminating it from all other Species of Bodies whatſoever: as for Inſtance, Ponderouſneſs, Ductility, Fixtneſſe, Yellowneſs, and ſome other Qualities, concurring in a portion of Matter, do with it conſtitute Gold, and making it belong to that Species we call Mettals, and to that ſort of Mettals we call Gold, do both denominate and diſcriminate it from Stones, Salts, Marchaſites, and all other ſorts of Bodies that are not Mettals, and from Silver, Braſs, Copper, and all Mettals except Gold. And whereas 'tis ſaid by ſome, that the Forme alſo of a Body ought to be the Principle of its Operations, we ſhall hereafter conſider in what ſenſe That is to be admitted or rejected; in the mean time it may ſuffice us, that even in the Vulgar Philoſophy 'tis acknowledg'd, that Natural Things for the moſt part operate by their Qualities, as Snow dazles the Eyes by its Whiteneſs, and Water ſcatter'd into drops of Rain falls from the Clouds upon the account of its Gravity. To which I ſhall adde, that how great the power may be, which a Body may exerciſe by virtue of a ſingle Quality, may appear by the Various and oftentimes Prodigious Effects, which Fire produces by its Heat, when thereby it melts Mettals, calcines Stones, deſtroyes whole Woods and Cities &c. And if ſeveral Active Qualities convene in one Body, (as that which in our Hypotheſis is meant by Forme, uſually compriſes ſeveral of them,) what great things may be thereby perform'd, may be ſomewhat gueſs'd at by the ſtrange things we ſee done by ſome Engines, which, being, as Engins, undoubtedly devoid of Subſtantial Forms, muſt do thoſe ſtrange things they are admir'd for, by virtue of thoſe Accidents, the

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† *Ariſt. Metaph. lib.7. cap. 8.*

Shape, Size, Motion, and Contrivance, of their parts. Not to mention, that in our Hypotheſis, beſides thoſe Operations that proceed from the Eſſential Modification of the Matter, as the Body (compoſ'd of Matter and neceſſary Accidents) is conſider'd *per modum unius*, as one Entire Corporeal Agent, it may in diverſe caſes have other Operations, upon the account of thoſe particular Corpuſcles, which though they concurre to compoſe it, and are in reference to the whole conſider'd but as its parts, may yet retain their own particular Nature, and diverſe of the peculiar Qualities: as in a Watch, beſides thoſe things which the Watch performs as ſuch, the ſeveral parts whereof it conſiſts, as the Spring, the Wheels, the String, the Pins, &c. may have each of them its peculiar Bulk, Shape, and other Attributes, upon the account of one or more of which, the Wheel or Spring &c. may do other things then what it doth, as meerly a Conſtituent part of the Watch. And ſo in the Milk of a Nurſe, that hath ſome hours before taken a Potion, though the Corpuſcles of the purging Medicine appear not to ſenſe diſtinct from the other parts of the Milk, which in far greater numbers concurre with them, to conſtitute that white Liquor, yet theſe Purgative Particles, that ſeem but to be part of the Matter whereof the Milk conſiſts, do yet ſo retain their own Nature and Qualities, that being ſuck'd in with the reſt by the Infant, they quickly diſcriminate and diſcover themſelves by purging him. But of this Subject more hereafter.

(*Of Generation*, *Corruption*, *and Alteration*.)

VIII. IT now remains that we declare, what, according to the Tenour of our Hypotheſis, is to be meant by *Generation*, *Corruption*, and *Alteration*, (Three Names, that have very much puzled and divided Philoſophers.) In order hereunto we may conſider,

1. That there are in the World great ſtore of Particles of Matter, each of which is too ſmall to be, whilſt ſingle, Senſible; and being Entire, or Undivided, muſt needs both have its Determinate Shape, and be very Solid. Inſomuch, that though it be *mentally*, and by Divine Omnipotence diviſible, yet by reaſon of its Smalneſs and Solidity, Nature doth ſcarce ever actually divide it; and theſe may in this ſenſe be call'd *Minima* or *Prima Naturalia*.

2. That there are alſo Multitudes of Corpuſcles, which are made up of the Coalition of ſeveral of the former *Minima Naturalia*; and whoſe Bulk is ſo ſmall, and their Adhæſion ſo cloſe and ſtrict, that each of theſe little Primitive Concretions or Cluſters (if I may ſo call them) of Particles is ſingly below the diſcernment of Senſe, and though not

abſolutely indiviſible by Nature into the *Prima Naturalia* that compoſ'd it, or perhaps into other little Fragments, yet, for the reaſons freſhly intimated, they very rarely happen to be actually diſſolv'd or broken, but remain entire in great variety of ſenſible Bodies, and under various forms or diſguiſes. As, not to repeat, what we lately mention'd, of the undeſtroy'd purging Corpuſcles of Milk; we ſee, that even Groſſer and more compounded Corpuſcles may have ſuch a permanent Texture: For Quickſilver, for inſtance, may be turn'd into a red Powder for a Fuſible and Malleable Body, or a Fugitive Smoak, and diſguiſ'd I know not how many other wayes, and yet remain true and recoverable Mercury. And theſe are as it were the Seeds, or immediate Principles of many ſorts of Natural Bodies, as Earth, Water, Salt, &c. and thoſe ſingly inſenſible, become capable, when united, to affect the Senſe: as I have try'd, that if good Camphire be kept a while in pure Spirit of Wine, it will thereby be reduc'd into ſuch Little parts, as totally to diſappear in the Liquor, without making it look leſs clear then fair Water, and yet, if into this Mixture you pour a competent quantity of Water, in a moment the ſcatter'd Corpuſcles of the Camphire will, by re-uniting themſelves, become White, and conſequently Viſible, as before their Diſperſion.

3. That as well each of the *Minima Naturalia*, as each of the Primary Cluſters above mention'd, having its own Determinate Bulk & Shape, when theſe come to adhere to one another, it muſt *alwaies* happen, that the Size, and *often*, that the Figure of the Corpuſcle compos'd by their Juxta-poſition and Cohæſion, will be chang'd: and *not ſeldome* too, the Motion either of the one, or the other, or both, will receive a new Tendency, or be alter'd as to its Velocity,

or otherwiſe. And the like will happen, when the Corpuſcles, that compoſe a Cluſter of Particles, are disjoyn'd, or any thing of the little Maſs is broken off. And whether any thing of Matter be added to a Corpuſcle, or taken from it in either caſe, (as we juſt now intimated,) the Size of it muſt neceſſarily be alter'd, and for the moſt part the Figure will be ſo too, whereby it will both acquire a Congruity to the Pores of ſome Bodies, (and perhaps ſome of our Senſories,) and become Incongruous to thoſe of others, and conſequently be qualify'd, as I ſhall more fully ſhew you hereafter, to operate on diverſe occaſions, much otherwiſe then it was fitted to do before.

4. That when many of theſe inſenſible Corpuſcles come to be aſſociated into one viſible Body, if many or moſt of them be put into Motion, from what cauſe ſoever the Motion proceeds, That it ſelf may produce great Changes, and

new Qualities in the Body they compoſe; for *not onely* Motion may perform much, even when it makes not any viſible Alteration in it, as Air put into ſwift Motion, (as when it is blown out of Bellows) acquires a new Name, and is call'd *Wind*, and to the Touch appears far colder then the ſame *Air* not ſo form'd into a Stream: and Iron, by being briskly rubb'd againſt Wood or other Iron, hath its ſmall parts ſo agitated, as to appear hot to our Senſe: *but* this Motion oftentimes makes viſible Alterations in the Texture of the Body into which it is receiv'd, for alwaies the Moved parts ſtrive to communicate their Motion, or ſomewhat of the degree of it, to ſome parts that were before either at Reſt, or otherwiſe mov'd, and oftentimes the ſame Mov'd parts do thereby either disjoyn, or break ſome of the Corpuſcles they hit againſt, and thereby change their Bulk, or Shape, or both, and either drive ſome of them quite out of the Body, and perhaps lodge themſelves in their places, or elſe aſſociate them anew with others. Whence it uſually follows, that the Texture, is for a while at leaſt, and, unleſſe it be very ſtable and permanent, for good and all, very much alter'd, and eſpecially, in that the Pores or little Intervals intercepted betwixt the component Particles, will be chang'd as to Bigneſs, or Figure, or both, and ſo will ceaſe to be commenſurate to the Corpuſcles that were fit for them before, and become commenſurate to ſuch Corpuſcles of other Sizes and Shapes, as till then were incongruous to them. Thus we ſee that Water, by looſing the wonted agitation of its parts, may acquire the Firmneſſe and Brittleneſſe we find in Ice, and looſe much of the Tranſparency it had whilſt it was a Liquor. Thus alſo by very hard rubbing two pieces of Reſinous Wood againſt one another, we may make them throw out diverſe of their looſer parts into Steams and viſible Smoak, and may, if the Attrition be duely continued, make that commotion of the parts ſo change the Texture of the whole, as afterwards to turn the ſuperficial parts into a kind of Coal. And thus Milk, eſpecially in hot weather, will by the inteſtine, though languid, Motions of its parts, be in a ſhort time turn'd into a thinner ſort of liquor then Milk, and into Cream, and this (laſt nam'd) will by being barely agitated in a Churn, be turn'd in a ſhorter time into that Unctuous and conſiſtent Body we call Butter, and into thin, fluid, and ſower Butter-milk. And thus (to diſpatch) by the bruiſing of Fruit, the Texture is commonly ſo chang'd, that as we ſee particularly in Apples, that the Bruiſ'd part ſoon comes to be of another nature then the Sound part, the one differing from the other both in Colour, Taſt, Smell, and Conſiſtence. So that (as we have already inculcated)

Local Motion hath, of all other affections of Matter, the greateſt Intereſt in the Altering and Modifying of it, ſince it is not onely the Grand *Agent* or *Efficient* among Second Cauſes, but is alſo oftentimes one of the principal things that *conſtitutes the Forme* of Bodies: as when two Sticks are ſet on fire by long and vehement Attrition, Local *Motion* is not onely that which kindles the Wood, and ſo as an Efficient produces the Fire, but is That which principally concurrs to give the produced Stream of ſhining Matter, the name and nature of Flame: and ſo it concurrs alſo to conſtitute all Fluid Bodies.

5. And that ſince we have formerly ſeen, that 'tis from the Size, Shape, and Motion of the ſmall parts of Matter, and the Texture that reſults from the manner of their being diſpos'd in any one Body, that the Colour, Odour, Taſt, and other qualities of that Body are to be deriv'd, it will be eaſie for us

to recollect, That ſuch Changes cannot happen in a portion of Matter, without ſo much varying the Nature of it, that we need not deride the antient Atomiſts, for attempting to deduce the *Generation* and *Corruption* of Bodies from the fam'd σύγκρισις ϗ διάκρισις, the *Convention* and *Diſſolution*, and the *Alterations* of them, from the *tranſpoſition* of their (ſuppoſ'd) Atoms: For though indeed Nature is wont in the Changes ſhe makes among things Corporeal, to imploy all the *three* wayes, as well in *Alterations*, as *Generations* and *Corruptions*; yet if they onely meant, as probably enough they did, That of the *three* waies propoſ'd, the Firſt was wont to be the Principal in the *Generation* of Bodies, the ſecond in the *Corruption*, & the third in their *Alterations*, I ſhall not much oppoſe this Doctrine: though I take the Local Motion or *Tranſpoſition* of Parts, in the ſame portion of Matter, to bear a great ſtroak as well in reference to *Generation* and *Corruption*, as to *Alteration*: as we ſee when Milk, or Fleſh, or Fruit, without any remarkable addition or loſs of parts turns into Maggots, or other Inſects; and as we may more conſpicuouſly obſerve in the Præcipitation of Mercury without addition, in the Vitrification of Mettals, and other Chymical Experiments to be hereafter mention'd.

Theſe things premiſ'd, it will not now be difficult to compriſe in few words ſuch a Doctrine, touching the *Generation*, *Corruption*, and *Alteration* of Bodies, as is ſuitable to our *Hypotheſis*, and the former Diſcourſe. For if in a parcel of Matter there happen to be produc'd (it imports not much how) a Concurrence of all thoſe Accidents, (whether thoſe onely, or more) that Men by tacite agreement have thought *neceſſary* and *ſufficient* to conſtitute any one Determinate *Species* of things corporeal, then we ſay, That a Body belonging to that *Species*, as ſuppoſe a Stone, or a Mettal, is *Generated*, or produc'd *de novo*. Not that there is really any thing of *Subſtantial* produc'd, but that thoſe parts of Matter, that did indeed before præexiſt, but were either ſcatter'd and ſhar'd among other Bodies, or at leaſt otherwiſe diſpos'd of, are now brought together, and diſpos'd of after the manner requiſite, to entitle the Body that reſults from them to a *new Denomination*, and make it appertain to ſuch a Determinate *Species* of Natural Bodies, ſo that no new *Subſtance* is in Generation *produc'd*, but onely That, which was *praexiſtent*, obteins a new *Modification*, or manner of Exiſtence. Thus when the Spring, and Wheels, and String, and Balance, and Index &c. neceſſary to a Watch, which lay before ſcatter'd, ſome in one part, ſome in another of the Artificer's Shop, are firſt ſet together in the Order requiſite to make ſuch an Engine, to ſhew how the time paſſes, a Watch is ſaid to be *made*: not that any of the mention'd Material parts is *produc'd de novo*, but that till then the divided Matter was not ſo *contriv'd* and put together, as was requiſite to conſtitute ſuch a thing, as we call a Watch. And ſo when Sand and Aſhes are well melted together, and ſuffer'd to cool, there is Generated by the Colliquation that ſort of Concretion we call *Glaſs*, though it be evident, that its Ingredients were both præexiſtent, and do but by their *Aſſociation* obtain a New manner of exiſting together. And ſo when by the Churning of Creame, Butter and Butter-milk are generated, we find not any thing Subſtantial Produc'd *de novo* in either of them, but onely that the *Serum*, and the fat Corpuſcles, being put into Local Motion, do by their frequent Occurſions extricate themſelves from each other, and aſſociate themſelves in the new manner, requiſite to conſtitute the Bodies, whoſe names are given them.

And as a Body is ſaid to be *generated*, when it firſt appears clothed with all thoſe Qualities, upon whoſe Account Men have been pleaſ'd to call ſome Bodies *Stones*; others, *Mettals*; others, *Salts*, &c. ſo when a Body comes to looſe *all* or *any* of thoſe Accidents that are *Eſſential*, and neceſſary to the conſtituting of ſuch a Body, it is then ſaid to be *corrupted* or deſtroy'd, and is no more a Body of *that Kind*, but looſes its Title to its former Denomination. Not that any thing *Corporeal* or Subſtantial *periſhes* in this *Change*, but onely that the Eſſential Modification of the Matter is deſtroy'd: and though the Body be ſtill a *Body*, (no Natural Agent being able to *annihilate* Matter,) yet 'tis no longer *ſuch a Body*, as 'twas before, but periſheth in the capacity of a Body of that Kind. Thus if a Stone, falling upon a Watch, break it to pieces;

as, when the Watch was made there was no new Subſtance produc'd, all the Material parts (as the Steel, Braſs, String, &c.) being præexiſtent ſome where or other, (as in Iron,and Copper-Mines, in the Bellies of thoſe Animals, of whoſe Guts Men uſe to make Strings;) *ſo* not the leaſt part of the Subſtance of the Watch is loſt, but onely diſplac'd and ſcatter'd; and yet that Portion of Matter ceaſes to be a *VVatch* as it was before. And ſo (to reſume our late Example)when Creame is by Churning turn'd into Butter, and a Serous Liquor, the parts of the Milk remain aſſociated into thoſe two Bodies, but the White Liquor periſheth in the capacity of Milk. And ſo when Ice comes to be thaw'd in exactly cloſ'd Veſſels, though the Corruption be produc'd onely (for ought appears) by introducing a new Motion and Diſpoſition into the parts of the Frozen Water, yet it thereupon ceaſes to be *Ice*, however it be as much *VVater*, and conſequently as much a *Body*, as before it was frozen or thaw'd. Theſe and the like Examples may teach us rightly to underſtand that common Axiom of Naturaliſts, *Corruptio unius eſt generatio alterius*; *& è contrà*: for ſince it is acknowledged on all hands, that Matter cannot be annihilated, and ſince it appears by what we have ſaid above, that there are ſome Properties, namely *Size*, *Shape*, *Motion*, (or in its abſence, *Reſt*,) that are inſeparable from the actual parts of Matter; and ſince alſo the Coalition of any competent number of theſe parts is ſufficient to conſtitute a Natural Body, endow'd with diverſe ſenſible Qualities; it can *ſcarce* be otherwiſe, but that the ſame Agents, that ſhatter the Frame, or *deſtroy* the Texture of one Body, will by ſhuffling them together, and diſpoſing them after a New manner, bring them to *conſtitute* ſome new ſort of Bodies: As the ſame thing, that by burning deſtroyes Wood, turns it into Flame, Soot, and Aſhes. Onely I doubt, whether the Axiome do generally hold true, if it be meant, That *every Corruption muſt end in the Generation of a Body, belonging to ſome particular Species of things*, unleſſe we take Powders and fluid Bodies indefinitely for *Species* of Natural Bodies; ſince it is plain, there are multitudes of Vegetables, and other Concretions, which, when they rot, do not, as ſome others do, turn into Worms, but either into ſome ſlimy or watery Subſtance, or elſe (which is the moſt uſuall) they crumble into a kind of Duſt or Powder, which, though look'd upon as being the Earth, into which rotten Bodies are at length reſolv'd, is very far from being of an Elementary nature, but as yet a Compounded Body, retaining ſome, if not many, Qualities, which often makes the Duſt of one ſort of Plant or Animal differ much from that of another. And This will ſupply me with this Argument *Ad hominem*, viz. That ſince in thoſe *violent Corruptions* of Bodies, that are made by Outward Agents, ſhattering them into pieces, if the Axiome hold true, the New *Bodies emergent* upon the Diſſolution of the Former, muſt be really *Natural Bodies*, as (indeed divers of the Moderns hold them to be,) and Generated according to the courſe of Nature; as when Wood is deſtroy'd by Fire, and turn'd partly into Flame, partly into Soot, partly into Coals, and partly into Aſhes; I hope we may be allow'd to conclude, That thoſe *Chymical Productions*, which ſo many would have to be but *Factitious Bodies*, are *Natural ones*, and regularly Generated. For it being the ſame Agent, the Fire, that operates upon Bodies, whether they be expoſ'd to it in cloſe Glaſſes, or in Chimnies, I ſee no ſufficient reaſon, why the Chymical Oyls, and Volatile Salts, and other things which

Spagirites obtain from mixt Bodies, ſhould not be accounted Natural Bodies, as well as the Soot, and Aſhes, and Charcoal, that by the ſame fire are obtain'd from Kindled Wood.

But before we paſſe away from the mention of the Corruption of Bodies, I muſt take ſome notice of what is call'd their *Putrefaction*. This is but a Peculiar kind of Corruption, wrought ſlowly (whereby it may be diſtinguiſh'd from Deſtruction by Fire, and other nimble Agents) in Bodies: it happens to them for the moſt part by means of the Air, or ſome other Ambient Fluid, which by penetrating into the Pores of the Body, and by its agitation in them, doth uſually call out ſome of the more Agile and leſſe entangled parts of the Body, and doth almoſt ever looſen and diſlocate the parts in general, and thereby ſo change the Texture, and perhaps too the Figure, of the Corpuſcles, that compoſe it, that the Body, thus chang'd, acquires Qualities unſuitable to its Former Nature, and for the moſt part offenſive to Our Senſes , eſpecially of Smelling and Taſting: which laſt clauſe I therefore adde, not onely becauſe the Vulgar look not upon the Change of an Egge into a Chick as a *Corruption*, but as a *Perfection* of the Egge; but becauſe alſo I think it not improbable, that if by ſuch ſlow Changes of Bodies, as make them looſe their former Nature, and might otherwiſe paſſe for *Putrefaction*, many Bodies ſhould acquire better Sents or Taſts then before; or if Nature, Cuſtom, or any other cauſe ſhould much alter the Texture of our Organs of Taſting and Smelling, it would not perhaps be ſo well agreed on what ſhould be call'd Putrefaction, as that imports an *impairing Alteration*, but Men would find ſome favourabler Notion for ſuch Changes. For I obſerve, that Medlars, though they acquire in length of time ſuch a Colour and

Softneſs as rotten Apples, and other putrify'd Fruits do, yet, becauſe their Taſt is not then harſh as before, we call that *Ripeneſs* in them, which otherwiſe we ſhould call *Rottenneſs*. And though upon the Death of a fourfooted Beaſt, we generally call that Change, which happens to the Fleſh or Bloud, Putrefaction, yet we paſſe a more favourable judgment upon That, which happens to the Fleſh and other ſofter parts of that Animal, (whether it be a kind of large Rabbets, or very ſmall and hornleſſe Deer,) of which in *China*, and in the *Levant* they make Muſk; becauſe by the Change, that enſues the Animals death, the Fleſh acquires not an *odious*, but a *grateful Smell*. And we ſee, that ſome Men, whoſe Appetites are gratified by Rotten Cheeſe, think it Then not to have *degenerated*, but to have attain'd its *beſt State*, when having loſt its former Colour, Smell, and Taſt, and, which is more, being in great part turn'd into thoſe Inſects call'd Mites; 'tis both in a Philoſophical ſenſe *corrupted*, and in the æſtimate of the generality of Men grown *Putrid*. But becauſe it very ſeldom happens, that a Body by Generation acquires no other Qualities, then juſt thoſe that are abſolutely *neceſſary*, to make it belong to the *Species* that Denominates it; therefore in moſt Bodies there are diverſe other Qualities that may *be* there, or may be *miſſing*, without Eſſentially changing the Subject: as Water may be clear or muddy, odorous or ſtinking, and ſtill remain Water; and Butter may be white or yellow, ſweet or rancid, conſiſtent or melted, and ſtill be call'd Butter. Now therefore whenſoever a Parcel of Matter does *acquire* or *looſe* a Quality, that is not *Eſſential* to it, That Acquiſition or Loſſe is diſtinctly call'd *Alteration*, (or by ſome, *Mutation*:) the Acquiſt onely of the Qualities that are abſolutely *neceſſary* to conſtitute its Eſſential and Specifical difference, or the Loſs of any of *thoſe* Qualities, being ſuch a Change as muſt not be call'd meer *Alteration*, but have the particular name of Generation or Corruption; both which according to this Doctrine appear to be but ſeveral *Kinds of Alteration*, taken in a large ſenſe, though they are diſtinguiſh'd from it in a more ſtrict and Limited acception of that Terme.

And here we have a fair Occaſion to take notice of the Fruitfulneſſe and Extent of our Mechanical Hypotheſis: For ſince according to our Doctrine, the World we live in is not a Moveleſſe or Indigeſted Maſs of Matter, but an Αὐτόματον, or *Self moving Engine*, wherein the greateſt part of the common Matter of all Bodies is alwaies (though not ſtill the ſame parts of it) in Motion; & wherein Bodies are ſo cloſe ſet by one another, that (unleſſe in ſome very few and extraordinary, and as it were Præternatural caſes) they have either no Vacuities betwixt them, or onely here and there interpos'd, and very ſmall ones. Aud ſince, according to us, the various *manner* of the *Coalition* of ſeveral *Corpuſcles* into one viſible *Body* is enough to give them a peculiar Texture, and thereby fitt them to exhibit divers ſenſible Qualities, and to become a Body, ſometimes of one Denomination, and ſometimes of another; it will very naturally follow, that from the various Occurſions of thoſe innumerable ſwarms of little Bodies, that are mov'd to and fro in the World, there will be many fitted to ſtick to one another, and ſo compoſe Concretions ; and many (though not in the ſelf ſame place) disjoyn'd from one another, and agitated apart; and multitudes alſo that will be driven to aſſociate themſelves, now with one Body, and preſently with another. And if we alſo conſider on the one ſide, that the Sizes of the ſmall Particles of

Matter may be very *various*, their Figures almoſt *innumerable*, and that if a parcel of Matter do but happen to ſtick to one Body, it may chance to give it a new Quality, and if it adhere to another, or hit againſt ſome of its Parts, it may conſtitute a Body of another Kind; or if a parcel of Matter be knockt off from another, it may barely by That, leave It, and become it ſelf of another Nature then before. If, I ſay, we conſider theſe things on the one ſide; and on the other ſide, that (to uſe *Lucretius* his Compariſon) all that innumerable multitude of Words, that are contain'd in all the Languages of the World, are made of the various Combinations of ſome of the 24 Letters of the Alphabet; 'twill not be hard to conceive, that there may be an incomprehenſible variety of Aſſociations and Textures of the Minute parts of Bodies, and conſequently a vaſt Multitude of Portions of Matter endow'd with ſtore enough of differing Qualities, to deſerve diſtinct Appellations; though for want of heedfulneſſe and fit Words, Men have not yet taken ſo much notice of their leſſe obvious Varieties, as to ſort them as they deſerve, and give them diſtinct and proper Names. So that though I would not ſay, that Any thing can immediately be made of Every thing, as a Gold Ring of a *VVedge* of Gold, or Oyl, or Fire of Water; yet ſince Bodies, having but one common Matter, can be differenc'd but by Accidents, which ſeem all of them to be the Effects and Conſequents of Local Motion, I ſee not, why it ſhould be abſurd to think, that (at leaſt among Inanimate Bodies) by the Intervention of ſome very ſmall *Addition* or *Subſtraction* of Matter, (which yet in moſt caſes will ſcarce be needed,) and of an orderly *Series of Alterations*, diſpoſing by degrees the Matter to be tranſmuted, almoſt of any thing, may at length be made Any thing: as,though out of a *wedge* of Gold one cannot immediately make a *Ring*, yet by either Wyre-drawing that Wedge by degrees, or by melting it, and caſting a little of it into a Mould, That thing may eaſily be effected. And ſo though Water cannot immediately be tranſmuted into Oyl, and much leſs into Fire, yet if you nouriſh certain Plants with Water alone, (as I have done,) 'till they have aſſimilated a great quantity of Water into their own Nature, You may, by committing this Tranſmuted Water (which you may diſtinguiſh and ſeparate from that part of the Vegetable you firſt put in) to Diſtillation in convenient Glaſſes, obtain, beſides other things, a true Oyl, and a black combuſtible Coal,(and conſequently Fire,) both of which may be ſo copious, as to leave no juſt cauſe to ſuſpect, that they could be any thing neer afforded by any little Spirituous parts, which may be præſum'd to have been communicated by that part of the Vegetable, that is firſt put into the water, to that far greater part of it, which was committed to Diſtillation.

But, *Pyrophilus*, I perceive the Difficulty and Fruitfulneſſe of my Subject, have made me ſo much more prolix then I intended, that it will not now be amiſs to Contract the Summary of our *Hypotheſis*, and give you the Main Points of it with little or no Illuſtration, and without particular Proofs in a few words. We teach then (but without peremptorily aſſerting it,)

Firſt, That the Matter of all Natural Bodies is the Same, namely a Subſtance extended and impenetrable.

2. That all Bodies thus agreeing in the ſame common Matter, their Diſtinction is to be taken from thoſe Accidents that do diverſify it.

3. That Motion, not belonging to the Eſſence of Matter,(which retains its whole Nature, when 'tis at Reſt,) and

not being Originally producible by other Accidents, as They are from It, may be look'd upon as the Firſt and chief *Mood* or Affection of Matter.

4. That Motion, varioufly determin'd, doth naturally divide the Matter it belongs to, into actual Fragments or Parts; and this Diviſion obvious Experience, (and more eminently, Chymical Operations) manifeſt to have been made into parts exceedingly *minute*, and very often, too minute to be ſingly perceiveable by our Senſes.

5. Whence it muſt neceſſarily follow, that each of theſe Minute Parts, or *minima Naturalia* (as well as every particular Body, made up by the Coalition of any number of them,) muſt have its Determinate *Bigneſſe* or *Size*, and its own *Shape*. And theſe three, namely *Bulk*, *Figure*, and either *Motion* or *Reſt*, (there being no Mean between theſe two) are the three *Primary* and moſt *Catholick Moods* or Affections of

the *inſenſible* parts of Matter, conſider'd *each* of them *apart.*

6. That when *diverſe* of them are conſider'd *together*, there will neceſſarily follow here Below both a certain *Poſition* or *Poſture* in reference to the Horizon (as Erected, Inclining, or Level) of each of them, and a certain *Order*, or placing before, or behind, or beſides one another; (as when in a company of Souldiers, one ſtands *upright*, the other *ſtoops*, the other *lyes along* upon the Ground, they have various *Poſtures*; and their being plac'd *beſides* one another in Ranks, and *behind* one another in Files, are Varieties of their *Order*:) and when many of theſe ſmall parts are brought to Convene into one Body from their *primary Affections*, and their Diſpoſition, or *Contrivance* as to *Poſture* and *Order*, there reſults That, which by one Comprehenſive Name we call the *Texture* of that Body. And indeed theſe ſeveral Kinds of *Location*,

to borrow a Scholaſtical Terme,) attributed (in this 6th number) to the Minute Particles of Bodies, are ſo neer of Kinne, that they ſeem all of them referrable to (that One Event of their Convening,) *Scituation*, or *Poſition*. And theſe are the Affections that belong to a Body, as it is conſider'd in it ſelf, without relation to *ſenſitive* Beings, or to other Natural Bodies.

7. That yet, there being Men in the World, whoſe Organs of Senſe are contriv'd in ſuch differing wayes, that one Senſory is fitted to receive Impreſſions from ſome, and another from other ſorts of External Objects, or Bodies without them, (whether theſe act as Entire Bodies, or by *Emiſſion* of their Corpuſcles, or by *propagating* ſome Motion to the Senſory,) the Perceptions of theſe Impreſſions are by men call'd by ſeveral Names, as *Heat*, *Colour*, *Sound*, *Odour*; and are commonly imagin'd to proceed from certain diſtinct

and peculiar Qualities in the External Object, which have ſome reſemblance to the Ideas, their action upon the Senſes excites in the Mind; though indeed all theſe Senſible Qualities, and the reſt that are to be met with in the Bodies without us, are but the Effects or Conſequents of the above mentioned *primary Affections* of Matter, whoſe Operations are diverſify'd according to the nature of the Senſories, or other Bodies they work upon.

8. That when a Portion of Matter, either by the *acceſſion* or *Receſſe* of Corpuſcles, or by the *tranſpoſition* of thoſe it conſiſted of before, or by any *two* or *all* of theſe waies, happens to obtain a *concurrence of all* thoſe Qualities, which Men commonly agree to be *neceſſary* and *ſufficient* to Denominate the Body, which hath them, either a *Mettal*, or a *Stone*, or the like, and to rank it in any peculiar and determinate *Species* of Bodies, Then a Body of that Denomina-

tion is ſaid to be *Generated.*

9. This *Convention of Eſſential Accidents* being taken (not any of them Apart, but all) *together* for the Specifical Difference that *conſtitutes* the Body, and *diſcriminates* it from all other ſorts of Bodies, is by one Name, becauſe conſider'd as one *collective* Thing, call'd its *Forme*, (as Beauty, which is made up both of Symmetry of Parts, and Agreeableneſſe of Colours,) which is conſequently but a certain *Character*, (as I ſometimes call it,) or a *peculiar ſtate of Matter*, or, if I may ſo name it, an *Eſſential Modification*: a *Modification*, becauſe 'tis indeed but a Determinate *manner of Exiſtence* of the Matter, and yet an *Eſſential Modification*, becauſe that though the concurrent Qualities be but Accidental to Matter, (which with others in ſtead of Them, would be Matter ſtill,) yet they are *eſſentially neceſſary* to the Particular *Body*, which without thoſe Accidents would

not be a Body of that Denomination, as a *Mettal* or a *Stone*, but of ſome other.

10. Now a Body being capable of many *other* Qualities, *beſides* thoſe, whoſe Convention is *neceſſary* to make up its Form; the *acquiſition* or *loſſe* of any ſuch Quality is, by Naturaliſts in the more ſtrict ſenſe of that Terme, nam'd *Alteration*: as when Oyl comes to be frozen, or to change colour, or to grow rancid; but if all, or any of the Qualities, that are reputed *eſſential* to ſuch a Body, come to be *loſt* or *deſtroy'd*, that notable Change is call'd *Corruption*; as when Oyl being boyl'd takes fire, the Oyl is not ſaid to be *alter'd* in the former ſenſe, but *corrupted* or *deſtroy'd*, and the emergent Fire *generated*; and when it ſo happens, that the Body is *ſlowly corrupted*, and thereby alſo acquires *Qualities offenſive to our Senſes*, eſpecially of *Smell* and *Taſt*, (as when Fleſh, or Fruit grows rotten,)

that kind of *Corruption* is by a more particular Name call'd *Putrefaction*. But neither in this, nor in any other kind of Corruption is there any thing *ſubſtantial* deſtroy'd, (no ſuch thing having been produc'd in Generation, and Matter it ſelf being on all hands acknowledged *incorruptible*,) but onely that *ſpecial connexion of the Parts*, or *manner of their Coexiſtence*, upon whoſe account the Matter, whilſt it was in its former ſtate, was, and was call'd a Stone, or a Mettal, or did belong to any other Determinate *Species* of Bodies.

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CONSIDERATIONS
and
EXPERIMENTS,
Touching the *Origine* of
QUALITIES and *FORMS.*

THE HISTORICAL PART.

The I. SECTION.

The I. SECTION,

Containing the *Obſervations.*

IN the foregoing Notes I have endeavoured with as much Clearneſs, as the Difficulty of the Subject, and the Brevity I was confined to, permitted to give a Scheme or Summary of the Principles of the Corpuſcularian Philoſophy, as I apprehended them, by way of a ſhort Introduction to it, at leaſt as far as I judged neceſſary for the better underſtanding of what is contain'd in our Notes and Experiments concerning the Productions and Changes of particular Qualities. But though, I hope, I have not ſo affected Brevity, as to fall into Obſcurity; yet ſince theſe Principles are built upon the *Phænomena* of Nature, and deviſ'd in order to the Explication of them, I know not what I can do more proper to recommend them, then to ſubjoyn ſome ſuch Natural *Phænomena*, as either induce me to take up ſuch Notions, or which I was directed to find out by the Notions I had imbrac'd. And ſince I appeale to the Teſtimony of Nature to verifie the Doctrine I have been propoſing, about the Origine and Production of Qualities, (for that of Formes will require a diſtinct Diſcourſe,) I think it very proper to ſet down ſome Obſervations of what Nature does, without being over-rul'd by the Power and Skill of Man, as well as ſome Experiments wherein Nature is guided, and as it were Maſter'd by Art, that ſo ſhe may be made to atteſt the Truth of our Doctrine, as well, when ſhe diſcloſes her Self freely, and, if I may ſo ſpeak, of her Own accord, as when ſhe is as it were Cited to make her Depoſitions by the Induſtry of Man. The Obſervations will be but the more ſuitable to our Deſign for being Common and Familiar, as to the *Phænomena*, though perhaps New enough as to the Application to our Purpoſe. And as for the Experiments, becauſe thoſe that belong more immediately to this or that particular Quality, may be met with in the Notes that treat of It, I thought it not amiſſe that the Experiments ſhould be both Few in number, and yet ſo Pregnant, that every one of them ſhould afford ſuch differing *Phænomena*, as may make it applicable to more then One Quality.

I.

The Obſervation I will begin with ſhall be fetch'd from what happens in the Hatching of an Egge. For as familiar and obvious a thing as it is, (eſpecially after what the Learned *Fabricius ab Aqua pendente*, and a recenter Anatomiſt have delivered about them,) that there is a great Change made in the ſubſtance of the Egge, when 'tis by Incubation turn'd into a Chick: yet, as far as I know, this Change hath not been taken notice of, for the ſame purpoſe, to which I am about to apply it.

I conſider then, that in a Prolifick Egge, (for Inſtance that of a Hen,) as well the Liquor of the Yolk, as that of the White, is a Subſtance, as to ſenſe, Similar. For upon the ſame account that Anatomiſts and Phyſicians call ſeveral parts of the humane Body, as Bones, Membranes, &c. Similar, that is, ſuch, as that every Senſible part of it hath the ſame Nature or Denomination with the whole, as every Splinter of Bone is Bone, as every Shred of Skin is Skin.

And though I find by diſtilling the Yolks and Whites, they ſeem to be Diſſimilar Bodies, in regard that the White of an Egge (for Example) will afford Subſtances of a very differing Nature, as Flegme, Salt, Oyl, and Earth;

yet (not now to examine whether, or how far theſe may be eſteem'd Productions of the Fire, that are rather obtain'd from the White of the Egge, then were præexiſtent in it; not to mention this I ſay,) it doth not appear by Diſtillation, that the White of an Egg, is other then a Similar Body in the ſenſe above deliver'd. For it would be hard to prove, that one part of the White of an Egg will not be made to yield the ſame differing Subſtances by Diſtillation, that any other part does; and Bones themſelves, and other hard parts of a humane Body, that are confeſſedly Similar, may by Diſtillation be made to afford Salt, and Phlegme, and Spirit, and Oyl, and Earth, as well as the White of an Egg.

This being thus ſetled in the Firſt place, we may in the Next conſider, that by beating the White of an Egge well with a Whisk, you may reduce it from a ſomewhat Tenacious into a Fluid

Body, though this Production of a Liquor be, as we elſewhere noted, effected by a Divulſion, Agitation &c. of the parts, that is in a word, by a Mechanical change of the Texture of the Body.

In the Third place I conſider, that according to the exacteſt Obſervations of Modern Anatomiſts, which our own Obſervations do not contradict, the Rudiments of the Chick, lodg'd in the *Cicatricula*, or white Speck upon the Coat of the Yolk, is nouriſh'd, 'till it have obtain'd to be a great Chick, onely by the White of the Egg; the Yolk being by the Providence of Nature reſerv'd as a more ſtrong and ſolid Aliment, till the Chick have abſum'd the White, and be thereby grown great and ſtrong enough to digeſt the Yolk; and in effect you may ſee the Chick furniſh'd not onely with all the neceſſary, but divers other parts, as Head, Wings, Legs, and Beak, and Claws, whilſt the Yolk ſeems yet as it were untouch'd.

But whether this Obſervation about the Entireneſs of the Yolk be preciſely true, is not much material to our preſent purpoſe, nor would I be thought to build much upon it; ſince the Yolk it ſelf, eſpecially at that time, is wont to be fluid enough, and to be a Liquor perhaps no leſs ſo then the White was, and That is enough for my preſent purpoſe.

For in the Laſt place I conſider, that the Nutritive Liquor of an Egg, which is in it ſelf a Body ſo very ſoft, that by a little Agitation it may be made Fluid, and is readily enough diſſolvable in common cold water, this very Subſtance, I ſay, being brooded on by the Hen, will within two or three weeks be tranſmuted into a Chick, furniſh'd with Organical parts, as Eyes, Ears, Wings, Legs, &c. of a very differing Fabrick; and with a good number of Similar ones, as Bones, Cartilages, Ligaments, Tendons, Membranes, &c. which differ very much in Texture from one another;

nother; beſides the Liquors, as Blood, Chyle, Gall, &c. contain'd in the ſolid parts: So that here we have out of the White of an Egg, which is a Subſtance Similar, Inſipid, Soft, (not to call it Fluid,) Diaphanous, Colourleſſe, and readily diſſoluble in cold water, out of this Subſtance I ſay, we have by the new and various Contrivement of the ſmall parts it conſiſted of, an Animal, ſome of whoſe parts are not Tranſparent but Opacous; ſome of them Red, as the Bloud; ſome Yellow or Greeniſh, as the Gall; ſome White, as the Brain; ſome Fluid, as the Bloud, and other Juices; ſome Conſiſteut, as the Bones, Fleſh, and other ſtable parts of the Body; ſome Solid and Frangible, as the Bones, others Tough and Flexible, as the Ligaments, others Soft and looſly Cohærent, as the Marrow; ſome without Springs, as many of the parts; ſome with Springs, as the Feathers; ſome apt to mingle readily with cold water, as the Bloud, the Gall; ſome not to be *ſo* diſſolv'd in it, as the Bones, the Claws, and the Feathers; ſome well taſted, as the Fleſh and Bloud; ſome very ill taſted, as the Gall, (for That I have purpoſely and particularly obſerv'd.) In a word, we have here produc'd out of ſuch an uniforme Matter as the White of an Egg,

Firſt, new kind of Qualities, as (beſides Opacity) Colours, (whereof a ſingle Feather will ſometimes afford us Variety,) Odours, Taſts, and Heat in the Heart and Bloud of the Chick; Hardneſs, Smoothneſs, Roughneſs, &c.

Secondly, diverſe other Qualities, that are wont to be diſtinguiſh'd from Senſible ones, as Fluidity (in the Bloud and aqueous humor of the Eye,) Conſiſtency in the Griſles, Fleſh, &c. Hardneſſe, Flexibility, Springyneſſe, Toughneſs, unfitneſſe to be diſſolv'd in cold water, and ſeveral others. To which may probably be added

Thirdly, ſome Occult Properties as Phyſicians obſerve, that ſome Birds, as young Swallows, young Magpies afford Specifick, or at leaſt Noble Medicines, in the Falling ſickneſs, Hyſterical Fits, and divers other Diſtempers.

Fourthly, I very well foreſee it may be objected, that the Chick with all its parts is not a Mechanically contriv'd Engine, but faſhion'd out of Matter by the Soul of the Bird, lodg'd chiefly in the *Cicatricula*, which by its Plaſtick power faſhions the obſequious Matter, and becomes the Architect of its own Manſion. But not here to examine, whether any Animal, except Man, be other then a Curious Engine, I anſwer, that this Objection invalidates not what I intend to prove from the alledg'd Example. For let the Plaſtick Principle be what it will, yet ſtill, being a Phyſical Agent, it muſt act after a Phyſical manner, and having no other Matter to work upon but the White of the Egg, it can work upon that Matter but as Phyſical Agents, and conſequently can but divide the Matter into minute parts of ſeveral Sizes and Shapes, and by Local Motion variouſly context them, according to the Exigency of the Animal to be produc'd, though from ſo many various Textures of the produc'd parts there muſt naturally emerge ſuch differences of Colours, Taſts, and Conſiſtencies, and other Qualities as we have been taking notice of. That which we are here to conſider, is not what is the Agent or Efficient in theſe Productions, but what is done to the Matter to effect them. And though ſome Birds by an inbred Skill do very Artificially build their Curious Neſts, yet cannot Nature, that teaches them, enable them to do any more then ſelect the Materials of their Neſts, and by Local Motion divide, tranſport, and connect them after a Certain manner. And when Man himſelf, who is undoubtedly an Intelligent Agent, is to frame a Building or an Engine, he may indeed by the help of Reaſon and Art, contrive his Materials curiouſly and skilfully, but ſtill all he can do, is but to move, divide, tranſpoſe, and context the ſeveral parts, into which he is able to reduce the Matter aſſign'd him.

Nor need we imagine, that the Soul of that Hen, which having firſt produc'd the Egg, does after a while ſit on it, hath any peculiar Efficiency in hatching of a Chick: for the Egg will be well hatch'd by another Hen, though That which laid it be dead; and, which is more, we are aſſur'd by the Teſtimony of very good Authors, as well as of recent Travellers, that in ſome places, eſpecially in *Ægypt*, there needs no Bird at all to the Production of a Chick out of an Egg, ſince they hatch multitudes of Eggs by the regulated heat of Oven's, or Dunghils. And indeed, that there is a Motion or Agitation of the parts of the Egg by the external heat, whereby it is hatch'd, is evident of its ſelf, and not (as far as I know) deny'd by any, and that alſo the white Subſtance is abſumed and contexted, or contriv'd into the Body of the Chick, and its ſeveral parts, is manifeſt to ſenſe; eſpecially if one hath the Curioſity to obſerve the progreſs of the Chicks Formation and Increment. But as 'tis evident, that as theſe two things, the Subſtance of the White, and the Local Motion, wherein the External Heat neceſſary to Incubation puts its parts, do eminently concurr to the Production of the Chick; ſo that the Formative Power (whatever that be) doth any more then guide theſe Motions, and thereby aſſociate the fitted Particles of Matter after the manner requiſite to conſtitute a Chick, is that which I think will not eaſily be evinc'd. And I might to what I ſaid of the Egg, adde ſeveral things touching the Generation of Viviparous

viparous Animals, which the Learned *Fabricius ab Aqua pendente*, as well as ſome of the Antient Philoſophers, would have to be generated from an Imperfect kind of Eggs: but I take the Eggs of Birds to be much fitter to inſtance in, becauſe they are things that we have more at command, and wherewith we can conveniently make more Trials and Obſervations; and eſpecially becauſe in perfect Eggs the Matter to be tranſmuted is more cloſely lock'd up, and being kept from any viſible ſupply of Matter, confin'd to be wrought upon by the External Heat, and by its own Vital Principle within.

II.

Water being generally eſteem'd an Elementary Body, and being at leaſt far more Homogeneous then Bodies here below are wont to be; it may make very much for our preſent purpoſe to ſhew, that Water it ſelf, that is Fluid, Taſtleſſe, Taſtleſs, Inodorous, Diaphanous, Colourleſs, Volatile,&c. may, by a differing Texture of its Parts, be brought to conſtitute Bodies of Attributes very diſtant from theſe. This I thought might be done, by nouriſhing Vegetables with ſimple water. For in caſe I could do ſo, all, or the greateſt part of that which would accrue to the Vegetable thus nouriſh'd, would appear to have been materially but Water, with what Exotick Quality ſoever it may afterwards,when tranſmuted,be endow'd.

The Ingenious *Helmont* indeed mentions an Experiment ſomewhat of this nature,though not to the ſame purpoſe, which he made by planting a Branch of Willow into a Pot full of Earth, and obſerving the increaſe of Weight he obtain'd after divers years, though he fed the Plant but with Rain water. And ſome Learned Modern Naturaliſts have conjectur'd at the eaſy Tranſmutableneſſe of Water, by what happens in

Gardens and Orchards, where the ſame Showers or Rain after a long Drought makes a great number of differing Plants to flouriſh. But though theſe things be worthy of their Authors, yet I thought they would not be ſo fit for my purpoſe, becauſe it may be ſpeciouſly enough objected, That the Rain water does not make theſe Plants thrive and flouriſh, by immediately affording them the Aliments they aſſimilate into their own Subſtance, but by proving a Vehicle, that diſſolves the Saline, and other Alimental Subſtances of the Earth, and dilutes both them and the nutritive Juice, which, in a part of the Plant its ſelf, it may find too much thickned by the Drought or Heat of the ambient Air, and by this means it contributes to the nouriſhment of the Plant, though it ſelf be inſenſibly afterwards exhal'd into vapours. And indeed Experience ſhews us, that ſeveral Plants, that thrive not well without Rain water, are not yet nouriſh'd by it alone, ſince when Corn in the Field, and Fruit-trees in Orchards have conſum'd the Saline and Sulphureous Juices of the Earth, they will not proſper there, how much Rain ſoever falls upon the Land, till the Ground by Dung or otherwiſe be ſupply'd again with ſuch aſſimilable Juices. Wherefore I rather choſe to attempt the making of Plants grow in Viols fill'd with Water, not onely to prevent the forementioned Objection, and alſo to make the Experiment leſſe tedious, but that I might have the pleaſure of ſeeing the progreſs of Nature in the Tranſmutation of Water; and my Obſervations of this kind as Novelties, unmention'd by any other Writer, I ſhew'd divers Ingenious Freinds, who having better Opportunities then I of ſtaying in one place, have attempted the like, and made ſuccesful Trials, which, I ſuppoſe, will not be conceal'd from the publick. Of my Obſervations about things of this kind, I can at preſent find but few among my *Adverſaria*; but in Them I find enough for my preſent turn. For They and my Memory inform me, that *Vinca per Vinca*, *Raphanus Aquaticus*, Spearemint, and even *Ranunculus* it ſelf, did grow and proſper very well in Viols filld with fair water, by whoſe Necks the Leaves were ſupported, and the Plant kept from ſinking: ſome of theſe were onely Cuttings without Roots, divers of them were left in the water all the Autumn, and great part of the Winter, and at the latter end of January were taken out verdant, and with fair Roots, which they had ſhot in the water. And beſides I find, that particularly a Branch or Sprig of *Raphanus Aquaticus* was kept full nine Months, and during that time wither'd not the whole Winter, and was taken out of the water with many fibrous Roots, and ſome green Buds, and an increaſe of Weight, and that a Stump of *Ranunculus* did ſo proſper in the water, that in a Months time it had attain'd to a pretty deale more then double the weight it had, when it was put in. And the next Note, which I find concerning theſe Plants, informes me, that the above mention'd Crowsfoot being taken out *agen* at ſix Months after it was put in, weigh'd a Drachm and a half wanting a Grain and a half, that is, ſomewhat above Thrice as much as it did at firſt. This laſt Circumſtance (of the increaſe of Weight) I therefore thought fit particularly to make Trial of, and ſet down upon this account among others, That having doubted the Roots and Leaves, that ſeem'd produc'd out of the Water, might really be ſo, by an Oblongation and an Expanſion of the Plants, (as I have purpoſely try'd, that an Onion weigh'd and laid up in the Spring, though after ſome weeks keeping in the Air it ſhot Blades, whereof one was five Inches long, in ſtead of incorporating the Air or terreſtrial *Effluviums* with it ſelf, and conſequently thereby growing heavier, had loſt nine Grains of its former weight;) it might by this Circumſtance appear, that there may be a real Aſſimilation and Tranſmutation of Water into the Subſtance of the Vegetable, as I elſewhere alſo ſhew by other proofs. For this being made out, from thence I infer, That the ſame Corpuſcles, which, convening together after one manner, compoſe that fluid, Inodorous, colourleſs, and inſipid Body of Water being contexted after other manners, may conſtitute differing Concretes, which may have Firmeneſs, Opacity, Odours, Smels, Taſts, Colours, and ſeveral other manifeſt Qualities, and that too very different from one another. And beſides all this, theſe diſtinct Portions of Tranſmuted Water may have many other Qualities, without excepting thoſe that are wont to be call'd Specifick, or Occult, witneſs the ſeveral Medicinal Virtues attributed by Authors to Spearmint, and to Periwinckle, to Majorane, and to *Raphanus Aquaticus*. And as for *Ranunculus*, that Plant being reckoned among Poiſonous ones, and among thoſe that raiſe Bliſters, 'twill be eaſily granted, that it hath, as other Poiſons, an Occult Deleterial faculty; and indeed it ſomewhat deſerves our wonder, that ſo inſipid and innocent a thing as fair Water, ſhould be capable to be turn'd into a Subſtance of ſuch a piercing and cauſtick Nature, as by Contact to raiſe Bliſters on an humane Body. And yet perhaps that is no leſſe ſtrange, which we elſewhere relate, That a Plant, conſiſting chiefly of Tranſmuted Water, did by Diſtillation afford us a true Oyl, that would not mingle with Water, and conſequently was eaſily convertible into Fire. But whether or no this Experiment, or any ſuch like, prove, that almoſt All things may be made of All things, not immediately, but by intervention of ſucceſſive Changes and Diſpoſitions, is a Queſtion to which we elſewhere ſay ſomething, but are not willing in this place to ſay any thing. And if it be here objected, That the ſolid Subſtance, that accrues to a Plant rooted in Water, procceds not at all from the water it ſelf, but from the Nitrous, fat, and earthy Subſtances, that may be preſum'd to abound even in common Water, not here to repeat what I elſewhere ſay about this Objection, I ſhall at preſent reply, That though as to divers Plants, that flouriſh after Raine, I am apt to think, as I intimated above, that they may in part be nouriſh'd as well by the Saline and Earthy Subſtances, to which the Rain uſually prooves a Vehicle, as by the Rain it ſelf; yet as to what the Objection holds forth about the Plants, that grow not in the Ground, but in Glaſſes fill'd with Water, it ſhould not be barely ſaid but prov'd, which he will not perhaps think eaſie to be done, that conſiders how vaſt a quantity of fair Water is requiſite to be exhal'd away, to obtain as much as one Ounce of dry Reſidents, whether Saline or Earthy.

III.

That a Plant, growing in the Earth, doth by the faculties of its Vegetative Soul attract the Juices of the Earth, that are within its reach, and ſelecting thoſe parts that are congruous to its Nature, refuſe the reſt, is the general Opinion of Philoſophers, and Phyſicians: and therefore many Naturaliſts are not wont much to marvail, when they ſee a Tree bear a Fruit that is ſowr or bitter, becauſe they preſume, that Nature hath in the Root of the Tree cull'd out ſuch parts of the Alimental Juice of the Earth, as being made to convene into one Fruit, are fit to make it of ſuch a Quality. But 'tis worth obſerving for our preſent purpoſe what happens both in ordinary Graftings, and eſpecially in that kind of Inſition (taking the word in a large ſenſe) which is commonly call'd Inoculation. For though we may preſume, that the Root of a white Thorne (for Inſtance) may electively attract its Aliment from the Earth, and chooſe that which is fitteſt to produce the Ignoble fruit, that is proper for that Plant: yet we cannot reaſonably ſuppoſe, that it ſhould in its attraction of Aliment have any Deſigne of providing an Appropriate Nutriment for a Peare, and yet the known Experience of Gardiners, and our own Obſervations manifeſt, that the Cyons of a Pear tree will take very well upon a White thornſtock, and bring forth a well taſted fruit, very differing in many qualities from that of the White thorn. I have alſo learn'd from thoſe that are expert, That though Apples and Pears, being but Vulgar Fruit, are ſeldome propagated but by Grafting; yet they may be propagated likewiſe by Inoculation, (which ſeems to be but a kind of Grafting with a Bud.) Now in the Inoculations, that are made upon Fruit trees, tis very obſervable, and may much countenance what we are endeavouring to prove, that a little Vegetable Bud, (that is no Seed, properly ſo call'd,) not ſo big oftentimes as a Pea, ſhould be able ſo to tranſmute all the Sap that arrives at it, that though this Sap be already in the Root, and in its paſſage upwards determin'd by Natures Intention, as Men are wont to ſpeak, to the production of the Fruit that is natural to the Stock; yet this Sap ſhould by ſo ſmall a Vegetable Subſtance as a Bud, (whether by the help of ſome peculiar kind of Strainer, or by the Operation of ſome powerful Ferment lodged in it, or by both theſe, or ſome other cauſe,) be ſo far chang'd and overrul'd, as to conſtitute a Fruit quite otherwiſe qualify'd, then that which is the Genuine production of the Tree, and which is actually produc'd by thoſe other portions of the like Sap, which happen'd to nouriſh the prolifick Buds that are the Genuine Of-ſpring of the Stock; ſo that the ſame Sap, that in one part of a Branch conſtitutes (for inſtance) a Cluſter of Haws, in another part of the ſame Branch may conſtitute a Pear. And that which is further remarkable to our preſent purpoſe, is, That not onely the Fruites made of the ſame Sap do often differ from one another in Shape, Bigneſs, Colour, Odour, Taſt, and other obvious Qualities, as well as Occult ones: but that though the Sap it ſelf be (oftentimes) a Wateriſh and almoſt Inſipid Liquor, that appears to ſenſe Homogeneous enough, and even by Diſtillation affords, very little beſides Flegme; yet this Sap is not onely convertible by Buds of ſeveral Natures into differing Fruits, but in one and the ſame Fruit the tranſmuted Sap ſhall by differing Textures be made to exhibit very differing, and ſometimes contrary Qualities. As when (for inſtance) a Peach bud does not onely change the Sap that comes to it into a Fruit, very differing from that which the Stock naturally produceth, but in the Skin of the Peach it muſt be red, in the Kernel white, and in other parts of other Colours; the Fleſh of it muſt be fragrant, the Stone inodorous, the Fleſh ſoft and yielding, the Stone very hard and brittle, the Meat pleaſantly taſted, the Kernel bitter; not to mention, that Peach Bloſſoms, though produc'd alſo by the Bud, are of a Colour and Texture very differing from that of the Fruit, and are enobled with an Occult Quality, which the Fruit hath not, I mean a Purgative Virtue: So that from Inoculations we may learn, That a flegmatick Liquor, that ſeems Homogeneous enough,& but very ſlenderly provided with other manifeſt Qualities then

common water, may, by being variouſly contexted by the Buds of Trees, be tranſmuted into Bodies endow'd with new, and various, and conſiderable Sents, Colours, Taſts, Solidity, Medicinal vertues, and divers other Qualities manifeſt, and occult.

If it be here ſaid, that theſe Qualities are the productions of the Plaſtick Power reſiding in prolifick Buds, which indeed (to me) ſeem to be but very minute Boughs; I ſhall return the ſame Anſwer that I did to the like Objection, when 'twas propoſ'd in the Firſt Obſervation.

Hitherto I have onely argued from vulgar Inoculations, but there may be others, as well more conſiderable, as leſſe ordinary; and I remember I have ſeen a Tree, whereof, though the Stock was of one ſort of good Fruit, there were three more and differing kinds of Stone-fruit, that had been made to take by Inoculation; and two of thoſe inoculated Boughs had actually Fruit on them, and the third, though it had as yet no Fruit, becauſe the Seaſon for that ſort of Plants to bear it was not yet come, yet the Shoot was ſo flouriſhing, that we concluded, that the Bloſſoms would in due time be ſucceeded by fruit. And ſince I have been ſpeaking of the differing Qualities of the parts of the ſame Fruit, I am content to adde two things: the one that *Garcias ab Horto*, a Claſſick Author, (and Phyſician to the Indian Viceroy) affirmes * with ſome ſolemnity, (as wondering that a Learned man ſhould write otherwiſe,) that though the fruit we call *Caſſia fiſtula* be very commonly uſ'd, both here and in the *Indies* as a Purging Medicine, yet the Seeds of this Solutive *Caſſia* are Aſtringent. The other: That of late years there have been often brought into England from the *Carybbe* Iſlands, certain Kernels of a fruit, which thoſe

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* *Aromat. Hiſt. lib.* 1. *cap.* 29. *de Caſſia ſolutiva.*

that have ſeen it grow, liken to a white Pear-plumme; theſe are ſo ſtrongly Purgative, and alſo Emetick, that the Ingenious Mr. *Lygon* * tells us, that five of them wrought with him a Dozen times upwards, and above Twenty downwards; and yet the ſame Author aſſures us, (which is likewiſe here a receiv'd Tradition among them that are curious of this fruit,) That in the Kernel, in the parting of it into halfes, (as when our Hazle Nuts in *England* part in the middle longwiſe) you ſhall find a thin Filme, which looks of a faint Carnation, (which colour is eaſily enough diſcerned, the reſt of the Kernel being perfectly white,) and that taking out the Filme you may eat the Nut ſafely, without feeling any Operation at all, and 'tis as ſweet as a Jordan Almond. [A Learned Man, that practiſ'd Phyſick in *America*, being inquir'd of by me concerning the Truth of this Relation, anſwer'd, That though he had divers times given thoſe Nuts as Cathartick Remedies, yet he had not that Curioſity to take out the Filmes, finding it the Univerſal belief, that the Purgative faculty conſiſted therein.) And I remember, that the famous * *Monardes* doth ſomewhat countenance this Tradition, where ſpeaking of another Purging fruit, that alſo comes from *America*, (from *Cartagena*, and *Nombre de Dios*,) he takes notice, that theſe purging Beans (which are like ours, but ſmaller) have a thin Skin, that divides them through the middle, which muſt (together with the external Rind) be caſt away, elſe they will work ſo violently both upwards and downwards, as to bring the Taker into hazard of his Life: whereas he commends theſe Beans rightly prepar'd, not onely as a pleaſant Medicine, that doth without trouble purge both Choler, Flegme, and groſs Humors, for which it is celebrated among the *Indians*.

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* Ligon's *Hiſtory of Barbados. pag.* 67. 68.

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* See *Nicholaus Monardes*, under the Title, *Fabæ Purgatrices*.

To theſe ſtories of our Countrymen, and *Monardes*, I ſhall ſubjoin another, which I find related by that great Rambler about the World, *Vincent le Blanck*, who giving us an Account of a publick Garden, which he viſited in *Africa*, in the Territories of the Lord of *Caſima*, not far from the Borders of *Nubia*, which he repreſents as the curioſeſt Garden he ſaw in all the Eaſt, he mentions this among other Rarities, "There were (ſayes he) other ſorts of Fruit, which I never ſaw but there, and one among the reſt leav'd like a Sycamore, with fruit like the Golden Apple, but no Gall more bitter, and within five Kernels, as big as Almonds, the Juice whereof is ſweet as Sugar, betwixt the Shell and the Nut there grows a thick ~~Skin of~~ a Carnation colour, which taken

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Vincent le Blanck's Survey of the World: *Part.* 2. *p.* 260.

taken before they be throughly ripe, they preſerve with Date Vinegar, and make an excellent Sweetmeat, which they preſent to the King as a great Curioſity.

IV.

The Fourth and laſt Obſervation I ſhall at preſent mention, is afforded me by the conſideration of Rotten Cheeſe. For if we take notice of the difference betwixt two parts of the ſame Cheeſe, whereof the one continues ſound by preſerving its Texture, and the other hath ſuffer'd that Impairing Alteration of Texture we call Rottenneſs, we may often ſee a manifeſt and notable Change in the ſeveral portions of a Body, that was before Similar. For the Rotten part will differ from the Sound in its *Colour*, which will be ſometimes Livid, but moſt commonly betwixt Green and Blew; and its *Odour*, which will be both ſtrong and offenſive; and its *Taſt*, which will be very Picquant, and to ſome men much more pleaſant then before, but to moſt men odious; and in divers other Qualities, as particularly its *Conſiſtence,* it will be much leſſe Solid and more Friable then before; and if with a good Microſcope we look upon the moulded parts of many Cheeſes, we ſhall quickly diſcover therein ſome Swarms of little Animals, (the Mites,) furniſh'd with *variety* of Parts of differing Sizes, Shapes, Textures, &c. and diſcry a yet greater diverſity, both as to manifeſt Qualities (nor probably is it inferior as to Occult ones) betwixt the Mouldy part of the Cheeſe and the Untainted, then the unaſſiſted Eye could otherwiſe have diſcovered.

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* *The following Diſcourſe* (Of the Origine of Forms) *ought to have been placed before this foregoing Section of the* Hiſtorical Part.

OF THE ORIGINE OF FORMS.

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THe Origine of Forms, *Pyrophilus*, as it is thought the *Nobleſt*, ſo, if I miſtake not, it hath been found one of the moſt *perplex'd* Enquiries, that belong to Natural Philoſophy: and, I confeſſe, it is one of the things that has invited me to look about for ſome more ſatisfactory Account, then the Schools uſually give of this matter, that I have obſerv'd, that the wiſeſt that have buſied themſelves in explicating Forms according to the Peripatetick Notions of them, have either knowingly Confeſs'd themſelves unable to explain them, or unwittingly Prov'd themſelves

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Formarum cognitio eſt rudis, confuſa, nec niſi per περιστάσεις; neque verum eſt, formæ ſubſtantialis ſpeciem recipi in intellectum, non enim in ſenſu uſquam fuit. J.C.Scalig.

Formæ ſubſtantiales ſunt incognitæ nobis, quia inſenſiles: ideo per qualitates, quæ ſunt principia immediata Tranſmutationis, exprimuntur. Aquinas ad 1. de generat. & corrupt.

In hac humanæ mentis caligine æquè forma Ignis ac Magnetis nobis ignota eſt. Sennertus.

to be ſo, by giving but unſatisfactory Explications of them.

It will not (I preſume) be expected, that I, who now write but *Notes*, ſhould enumerate, much leſſe examine all the various Opinions touching the Origine and Nature of Forms; it being enough for our purpoſe, if, having already intimated in our *Hypotheſis*, what, according to that, may be thought of this Subject; we now briefly conſider the general Opinion of our Modern *Ariſtotelians* and the Schools concerning it. I ſay, the *Modern* Ariſtotelians, becauſe diverſe of the *Antient*, eſpecially *Greek* Commentators of *Ariſtotle*, ſeem to have underſtood their Maſters Doctrine of Forms much otherwiſe, and leſſe incongruouſly, then his Latin followers, the Schoolmen and others, have ſince done. Nor do I expreſly mention *Ariſtotle* himſelf among the Champions of ſubſtantial Forms, becauſe though he ſeem in a place or two expreſly enough to reckon Formes among *Subſtances*, yet elſewhere the Examples he imploies to ſet forth the *Forms* of Natural things by, being taken from the *Figures* of artificial things, (as of a Statue, &c.) which are confeſſedly but *Accidents*, and making very little uſe, if any, of Subſtantial Forms to explain the *Phænomena* of Nature, He ſeems to me upon the whole matter, either to have been irreſolv'd, whether there were any ſuch Subſtances, or no, or to ſpeak ambiguouſly and obſcurely enough of them, to make it queſtionable, what his Opinions of them were.

But the ſumme of the Controverſy betwixt Us and the Schools is this, whether or no the Forms of Natural things, (the Souls of Men alwaies excepted) be in Generation *educed*, as they ſpeak, *out of the power of the Matter*, and whether theſe Forms be true *ſubſtantial Entities*, diſtinct from the other ſubſtantial Principle of Natural Bodies, namely Matter.

The Reaſons that move me to embrace the Negative, are principally theſe three. *Firſt*, That I ſee no neceſſity of admitting in Natural things any ſuch ſubſtantial Forms, Matter and the Accidents of Matter being ſufficient to explicate as much of the *Phænomena* of Nature, as we either do or are like to underſtand. *The next*, That I ſee not what uſe this puzling Doctrine of ſubſtantial Forms is of in Natural Philoſophy; the Acute *Scaliger*, and thoſe that have moſt buſied themſelves in the Indagation of them, having freely acknowledg'd, (as the more Candid of the Peripateticks generally do,) That the true Knowledg of Forms is too difficult and abſtruſe to be attain'd by them. And how like it is, that particular *Phænomena* will be explain'd by a Principal, whoſe Nature is confeſſedly ignor'd, I leave you to judg: but becauſe to theſe conſiderations I often have had, and ſhall have here and there occaſion to ſay ſomething in the body of theſe Notes, I ſhall at preſent inſiſt upon the *third*, which is, That I cannot conceive, neither how Forms can be generated, as the Peripateticks would have it, nor how the things, they aſcribe to them, are conſiſtent with the Principles of true Philoſophy, or even with what themſelves otherwiſe teach.

The Manner how Forms are educed out of the Power of the Matter, according to that part of the Doctrine of Forms, wherein the Schools generally enough agree, is a thing ſo Inexplicable, that I wonder not it hath put Acute men upon ſeveral *Hypotheſes* to make it out. And indeed the number of Theſe is of late grown too great to be fit to be here recited, eſpecially ſince I find them all ſo very unſatisfactory, that I cannot but think, the acute Sticklers for any of them are rather driven to embrace it by the palpable inconveniences of the wayes they reject, then by any thing they find to ſatisfy them, in that which they make choice of: and for my part I confeſs, I find ſo much Reaſon in what each Party ſayes againſt the Explications of the reſt, that I think they all Confute well, and none does well Eſtabliſh.

But my preſent way of Writing forbidding me to inſiſt on many Arguments againſt the Doctrine, wherein they moſt agree, I ſhall onely urge, That which I confeſs chiefly ſticks with me, namely that I find it not *Comprehenſible.*

I know the Modern Schoolmen fly here to their wonted Refuge of an Obſcure Diſtinction, and tell us, that the Power of Matter in reference to Forms is partly Eductive, as the Agent can make the Form out of it, and partly Receptive, whereby it can receive the Form ſo made; but ſince thoſe that ſay this, will not allow, that the Form of a generated Body was actually præexiſtent in its Matter, or indeed any where elſe, 'tis hard to conceive, how a Subſtance can be educ'd out of another Subſtance totally diſtinct in Nature from it, without being, before ſuch Eduction, actually exiſtent in it. And as for the Receptive Power of the Matter, That but fitting it to receive or lodge a Form, when brought to be United with it, how can it be intelligibly made out to contribute to the Production of a new Subſtance, of a quite differing Nature from that Matter, though it harbours it when produc'd? And 'tis plain, that the Humane Body hath a receptive Power in reference to the Humane Soule, which yet themſelves confeſs both to be a ſubſtantial Form, and not to be educ'd out of the Power of Matter. Indeed if they would admit the Form of a Natural Body to be but a more fine and ſubtle part of the Matter, as Spirit of Wine is of Wine, which upon its receſs remains no longer Wine, but Flegm or Vinegar, then the Eductive Power of Matter might ſignifie ſomething ; and ſo it might, if with us they would allow the Form to be but a Modification of the Mattter; for then it would import but that the Matter may be ſo order'd or diſpoſ'd by fit Agents, as to conſtitute a Body of ſuch a ſort and Denomination: and ſo (to reſume that Example) the Form of a Sphære may be ſaid to lurk potentially in a piece of Braſs, in as much as that Braſs may by caſting, turning, or otherwiſe, be ſo figur'd as to become a Sphære. But *this* they will not admit, leaſt they ſhould make Forms to be but Accidents, though it is for ought I know as little intelligible, how what is educ'd out of any Matter, without being either præexiſtent, or being any part of the Matter, can be a true Subſtance, as how that Roundneſs, that makes a piece of Braſs become a Sphere, can be a new Subſtance in it. Nor can they admit the *other way* of educing a Form out of Matter, as Spirit is out of

Wine, becauſe then not onely Matter will be corruptible againſt their grounds, but Matter and Form would not be two differing and ſubſtantial Principles, but one and the ſame, though diverſify'd by firmneſs, and groſſeneſs, &c. which are but Accidental differences. I know they ſpeak much of the efficacy of the Agent upon the Matter, in the Generation of Natural Bodies, and tell us ſtrange things of his manner of working. But not to ſpend time in examining thoſe obſcure niceties, I anſwer in ſhort; That ſince the Agent, be he what he will, is but a Phyſical and finite Agent, and ſince what way ſoever he works, he can do nothing repugnant to the nature of things, the difficulty, that ſticks with me, will ſtill remain. For if the Form produc'd in Generation, be, as they would have it, a Subſtance, that was not before to be found any where out of that portion of Matter, wherewith it conſtitutes the Generated Body; I ſay that either it muſt be produc'd, by refining or ſubtiliating ſome parts of the Matter into Form, or elſe it muſt be produc'd out of nothing, that is, Created, (for I ſee no Third way, how a Subſtance can be produc'd *de novo.*) If they allow the Firſt, then will the Form be indeed a Subſtance, but not, as they hold it is, diſtinct from Matter; ſince Matter, however ſubtiliated, is Matter ſtill, as the fineſt Spirit of Wine is as truly a Body, as was the Wine it ſelf, that yeilded it, or as is the Groſſer Flegm, from which it was extracted: beſides that, the Peripateticks teach, that the Form is not made of any thing of the Matter; nor indeed is it conceivable, how a Phyſical Agent can turn a Material into an Immaterial Subſtance, eſpecially Matter being, as they themſelves confeſſe, as well incorruptible as ingenerable. But if they will not allow, as indeed they do not, that the ſubſtantial Form is made of any thing that is Material, they muſt give me leave to believe, that tis produc'd out of Nothing, till they ſhew me, how a Subſtance can be produc'd otherwiſe, that exiſted no where before. And at this rate every Natural Body of a ſpecial Denomination, as Gold, Marble, Nitre, &c. muſt not be produc'd barely by Generation, but partly by Generation, and partly by Creation. And ſince tis confeſſ'd on all ſides, that no Natural Agent can produce the leaſt Atome of Matter, tis ſtrange they ſhould in Generation allow every Phyſical Agent the power of producing a Form, which, according to them, is not onely a Subſtance, but a far nobler one then Matter, and thereby attribute to the meaneſt Creatures that power of creating Subſtances, which the Antient Naturaliſts thought too great to be aſcrib'd to God himſelf, and which indeed is too great to be aſcrib'd to any other then Him, and therefore ſome Schoolmen and Philoſophers have deriv'd Forms immediately from God; but this is not onely to deſert *Ariſtotle* and the Peripatetick Philoſophy they would ſeem to maintain, but to put Omnipotence, upon working I know not how many thouſand Miracles every hour, to performe that (I mean the Generation of Bodies of new Denominations) in a ſupernatural way, which ſeems the moſt familiar effect of Nature in her ordinary courſe.

And as the Production of Forms out of the Power of Matter is for theſe Reaſons incomprehenſible to me, ſo thoſe things, which the Peripateticks aſcribe to their ſubſtantial Forms, are ſome of them ſuch, as, I confeſſe, I cannot reconcile my Reaſon to: for they tell us poſitively, that theſe Forms are Subſtances, and yet at the ſame time they teach, that they depend upon Matter, both *in fieri* and *in eſſe*, as they ſpeak, ſo that out of the Matter, that ſupports them, they cannot ſo much as exiſt, (whence they are uſually call'd Material Forms,) which is to make them Subſtances in name, and but Accidents in truth: for not to ask how(among Phyſical things) one Subſtance can be ſaid to depend upon another *in fieri*, that is not made of any part of it, the very notion of a Subſtance is to be a ſelf-ſubſiſting Entity, or that which needs no other Created Being to ſupport it, or to make it exiſt. Beſides that, there being but two ſorts of Subſtances, Material, and Immaterial, a ſubſtantial Form muſt appertain to one of the two, and yet they aſcribe things to it, that make it very unfit to be referr'd to either. To all this I adde, that theſe imaginary Material Forms do almoſt as much trouble the Doctrine of Corruption, as that of Generation: for if a Form be a true Subſtance really diſtinct from Matter, it muſt, as I lately noted, be able to exiſt of it ſelf, without any other Subſtance to ſupport it;

as thoſe I reaſon with confeſs, that the Soul of Man ſurvives the Body, it did before Death inform: whereas they will have it, that in Corruption the Form is quite aboliſh'd, and utterly periſhes, as not being capable of exiſting, ſeparated from the Matter, whereunto it was united: ſo that here again, what they call a Subſtance they make indeed an Accident, and beſides contradict their own vulgar Doctrine, That Natural things are upon their Corruption reſolv'd into the firſt Matter, ſince at this rate they ſhould ſay, that ſuch things are but partly reſolv'd into the firſt Matter, and partly either into Nothing, or into Forms, which being as well immaterial as the Souls of Men, muſt, for ought appears, be alſo, like them, accounted immortal.

I ſhould now examine thoſe Arguments, that are wont to be imploy'd by the Schools to evince their ſubſtantial Forms, but, beſides that the nature and ſcope of my preſent Work injoynes me Brevity, I confeſſe that, one or two excepted, the Arguments I have found mention'd, as the chief, are rather Metaphyſical, or Logical, then grounded upon the Principles and *Phænomena* of Nature, and reſpect rather Words then Things, and therefore I, who have neither inclination, nor leaſure, to wrangle about Terms, ſhall content my ſelf to propoſe, and very briefly anſwer two or three of thoſe that are thought the plauſibleſt.

Firſt then they thus argue. *Omne Compoſitum ſubſtantiale* (for it is hard to Engliſh well ſuch Uncouth Terms) *requirit materiam & formam ſubſtantialem, ex quibus componatur. Omne corpus naturale eſt compoſitū ſubſtantiale. Ergo* &c. In this Syllogiſme ſome do plauſibly enough deny the Conſequence, but for brevities ſake, I ſhall rather chooſe to deny the Minor, and deſire the Propoſers to prove it. For I know not any thing in Nature that is compoſ'd of Matter, and a Subſtance diſtinct from Matter, except Man, who alone is made up of an immaterial Form, and a humane Body; and if it be urg'd, that then other Bodies cannot be properly ſaid to be *Compoſita ſubſtantialia*: I ſhall, rather then wrangle with them, give them leave to find out ſome other name for other Natural things.

But then they argue in the next place, that, if there were no ſubſtantial Forms, all Bodies would be but *Entia per accidens*, as they ſpeak, which is abſurd. To which I anſwer, That in the Notion, that divers Learned men have of an *Ens per Accidens*, namely, that tis That which conſiſts of thoſe things, *quæ non ordinantur ad unum*, it may be ſaid, That though we do not admit ſubſtantial Forms, yet we need not admit Natural Bodies to be *Entia per accidens*; becauſe in them the ſeveral things that concur to conſtitute the Body, as Matter, Shape, Scituation, and Motion, *ordinantur per ſe & intrinſecè* to conſtitute one Natural Body. But, if this Anſwer ſatisfie not, I ſhall adde, that for my part, That which I am ſollicitous about, is, what Nature hath made things to be in themſelves, not what a Logician or Metaphyſician will call them in the Terms of his Art; it being much fitter in my judgment to alter Words, that they may better fit the Nature of Things, then to affix a wrong Nature to Things, that they may be accommodated to forms of Words, that were probably deviſ'd, when the things themſelves were not known or vvell underſtood, if at all thought on.

Wherefore I ſhall but adde one Argument more of this ſort, and That is, that, if there vvere no ſubſtantial Forms, neither could there be any ſubſtantial Definitions, but the Conſequent is abſurd, and therefore ſo is the Antecedent. To vvhich I reply, that ſince the Peripateticks themſelves confeſs the Forms of Bodies to be of themſelves unknown, all that this Argument ſeems to me to conclude, is but this, *That* if we do not admit ſomethings, that are not *in rerum natura*, we cannot build our Definitions upon them: nor indeed could we, if we ſhould admit ſubſtantial Forms, give ſubſtantial Definitions of Natural things, unleſſe we could alſo define Natural Bodies by things that we know not; for ſuch * the ſubſtantial Forms are (as we have ſeen already) confeſſ'd to be, by the wiſeſt Peripateticks, who pretend not to give the ſubſtantial Definition of any Natural *Compoſitum*, except Man. But it may ſuffice Us to have, inſtead of *ſubſtantial*, *eſſential* Definitions of things; I mean ſuch as are taken from the Eſſential Differences of things, which conſtitute them in ſuch a ſort of Natural Bodies, and diſcriminate them from all thoſe of any other ſort.

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* *Nego tibi ullam eſſe formam nobis notam plenè & planè, noſtramq; ſcientiam eſſe umbram in Sole. Scalig.*

Theſe three Arguments, *Pyrophilus*, for ſubſtantial Forms, You may poſſibly, as well as I, find variouſly propoſ'd, and perhaps with ſome light alterations multiply'd in the writings of the Peripateticks and Schoolmen; but all the Arguments of this kind that I have met with, may, if I miſtake not, be ſufficiently ſolv'd by the Anſwers we have given to theſe, or at leaſt by the grounds upon which thoſe Anſwers are built; thoſe ſeemingly various Arguments agreeing in this, That *either* they reſpect rather Words then Things, *or* that they are grounded upon precarious Suppoſitions; *or* laſtly that they urge That as an Abſurdity, which, whether it be one or not in thoſe, that admit the Peripatetick Philoſophy, to me, that do as little acquieſce in many of their other Principles, as I do in their ſubſtantial Forms, doth not appear any Abſurdity at all. And tis perhaps for fear that Arguments

ments of this ſort ſhould not much prevaile with Naturaliſts, that ſome of the Modern aſſertors of the Forms we queſtion, have thought it requiſite to adde ſome more Phyſical Arguments, which (though I have not found them all in the ſame Writers, yet) being in all but few, I ſhall here briefly conſider them.

Firſt then among the Phyſical Arguments, that are brought to prove ſubſtantial Forms, I find That the moſt confidently inſiſted on, which is taken from the ſpontaneous return of heated Water to Coldneſs, which Effects, ſay they, muſt neceſſarily be aſcrib'd to the Action of the ſubſtantial Form, whoſe office it is to preſerve the Body in its Natural ſtate, and, when there is occaſion, to reduce it thereunto: and the Argument indeed might be plauſible, if we were ſure, that heated Water would grow cold again (without the Avolation of any Parts more agitated then the reſt,) ſuppoſing it to be remov'd into ſome of the imaginary ſpaces beyond the World; but as the caſe is, I ſee no neceſſity of flying to a ſubſtantial Form, the Matter ſeeming to be eaſily explicable otherwiſe. The Water we heat is ſurrounded with our Air, or with ſome Veſſel, or other Body contiguous to the Air, and both the Air and the Water in theſe Climates are moſt commonly leſſe agitated, then the Juices in our hands, or other Organs of Touching, which makes us eſteem and call thoſe Fluids, cold. Now when the Water is expoſ'd to the fire, it is thereby put into a new Agitation, more vehement then that of the parts of our Senſory, which you will eaſily grant, if you conſider, that when the Heat is intenſe, it makes the Water boyl and ſmoak, and oftentimes run over the Veſſel; but when the Liquor is remov'd from the fire, this acquir'd Agitation muſt needs by degrees be loſt, *either* by the avolation of ſuch fiery Corpuſcles as the

Epicureans imagine to be got into heated Water, *or* by the Water's communicating the Agitation of its Parts to the contiguous Air, or to the Veſſel that contains it, till it have loſt its ſurpluſage of Motion, *or* by the ingreſs of thoſe frigorifick Atoms, wherewith (if any ſuch be to be granted) the Air in theſe Climates is wont to abound, and ſo be reduc'd into its former Temperature: which may as well be done without a ſubſtantial Form, as if a Ship ſwimming ſlowly down a River, ſhould by a ſudden guſt of Wind, blowing the ſame way the Stream runs, be driven on much faſter then before, the Veſſel upon the ceaſing of the Wind may, without any ſuch internal principle, return after a while to its former ſlowneſs of Motion. So that in this *Phænomenon*, we need not have recourſe to an internal principle, the Temperature of the external Air being ſufficient to give an acconnt of it. And if Water be kept, (as is uſual

ſual in poor mens houſes that want Cellars,) in the upper Rooms of the houſe, in caſe the Climate be hot, the Water will, in ſpight of the Form, continue far leſſe cold, then, according to the Peripateticks, its nature requires, all the Summer long. And let me here repreſent to the Champions of Forms, that, according to their Doctrine, the Fluidity of Water, muſt at leaſt as much proceed from its Form as the Coldneſſe, and yet this does ſo much depend upon the Temperature of the Air, that in *Nova Zembla* vaſt quantities of Water are kept in the hard and ſolid Form of Ice all the year long, by the ſharp Cold of the ambient Air, notwithſtanding all the pretended Office and Power of the ſubſtantial Form to keep it fluid, which it will never be reduc'd to be, unleſſe by ſuch a thawing Temperature of the Air, as would it ſelf, for ought appears, make it flow again, although there were no ſubſtantial Form *in rerum naturâ.*

There is another Argument much urg'd of late by ſome Learned Men, the ſubſtance whereof is this; That Matter being indifferent to one ſort of Accidents as well as to another, it is neceſſary there ſhould be a ſubſtantial Form, to keep thoſe Accidents, which are ſaid to conſtitute it, united to the Matter they belong to, and preſerve both them and the Body in their Natural ſtate; for ſince tis confeſſ'd, that Matter hath no appetite to theſe Accidents, more then to any others, they demand, how without a ſubſtantial Form theſe Accidents can be contain'd and preſerv'd? To this I might repreſent, that I am not ſo well ſatisfy'd with the Notion wont to be taken for granted, not onely by the vulgar, but by Philoſophers, of the Natural ſtate of Bodies; as if it were undeniable, that every Natural Body, (for as to ſome, I ſhall not *now* queſtion it,) has a certain ſtate, wherein Nature endeavours to preſerve it, and out of which it cannot be put, but by being put into a Præternatural ſtate. For the World being once conſtituted by the great Author of Things, as it now is, I look upon the *Phænomena* of Nature to be cauſ'd by the Local Motion of one part of Matter hitting againſt another, and am not ſo fully convinc'd, that there is ſuch a thing, as Natures deſigning to keep ſuch a parcel of Matter in ſuch a ſtate, that is cloth'd with juſt ſuch Accidents, rather then with any other. But I look upon many Bodies, eſpecially fluid ones, as frequently changing their ſtate, according as they happen to be more or leſſe agitated, or otherwiſe wrought upon by the Sun, and other conſiderable Agents in Nature. As the Air, Water, and other Fluids, if the temperature as to Cold or Heat, and Rarefaction or Condenſation, which they are in at the beginning of the Spring here at *London*, be pitcht upon as their Natural ſtate, then not onely in the torrid and frozen Zones they muſt have other and very differing Natural ſtates, but here it ſelf they will, almoſt all the Summer and all the Winter, as our Weather Glaſſes inform us, be in a varying Præternatural ſtate, becauſe they will be in thoſe ſeaſons either more hot and rarify'd, or more cold and condenſ'd, then in the beginning of the Spring. And in more ſtable and conſtant Bodies I take, in many caſes, the Natural ſtate to be but either *the moſt uſual ſtate*, or *That*, *wherein that, which produces a notable Change in them, finds them.* As when a ſlender piece of Silver, that is moſt commonly flexible, and will ſtand bent every way, comes to be well hammer'd, I count that Flexibility to be the Natural ſtate of that Mettal, becauſe moſt commonly Silver is found to be flexible, and becauſe it was ſo before it was hammer'd; but the Springineſſe it acquires by hammering is a ſtate, which is properly no more unnatural to the Silver then the other, and would continue with the Mettal as long as It, if both pieces of Silver, the one flexible, the other ſpringy, were let alone, and kept from outward violence: And as the Silver, to be depriv'd of its flexibleneſs, needed the violent Motion of the Hammer, ſo to deprive it of its Spring, it needs the violent Agitation of a nealing fire. Theſe things, and much more, I might here repreſent, but to come cloſe to the Objection, I Anſwer, That the Accidents ſpoken of are introduced into the Matter by the Agents or Efficient Cauſes, whatever they be, that produce in it what, in the ſenſe formerly explain'd, we call an *eſſential*(though not a *ſubſtantial*) Form. And theſe Accidents being once thus introduc'd into the Matter, we need not ſeek for a new ſubſtantial Principle to preſerve them there, ſince by the general law, or common courſe of Nature, the Matter qualify'd by them, muſt continue in the ſtate ſuch Accidents have put it into, till, by ſome Agent or other, it be forcibly put out of it, and ſo diveſted of thoſe Accidents; as in the formerly mention'd Example, borrow'd from *Ariſtotle*, of a Brazen Sphære, when once the Motion of Tools, impell'd and guided by the Artificer, have turn'd a piece of Braſs into a Sphære, there needs no new Subſtance to preſerve that round figure, ſince the Braſſe muſt retain it, till it be deſtroy'd by the Artificer himſelf, or ſome other Agent able to overcome the reſiſtance of the Matter, to be put into another figure. And on this occaſion let me confirme this *ad hominem*, by repreſenting, That there is not an inconſiderable Party among the Peripateticks themſelves, who maintain, That in the Elements the Firſt Qualities (as they call them) are inſtead of Forms, and that the Fire (for inſtance) hath no other Form then Heat and Dryneſſe, and the

Water then Coldneſſe and Moiſture. Now if theſe Bodies, that are the vaſteſt and the moſt important of the Sublunary World, conſiſt but of the Univerſal Matter, and the few Accidents; and if in theſe there needs no ſubſtantial Form to keep the Qualities of the Matter united to it, and conjoyn'd among themſelves, and preſerve them in that ſtate, as long as the Law of Nature requires, though beſides the four Qualities that are call'd *Firſt*, the Elements have divers others, as Gravity and Levity, Firmneſſe and Fluidity, Opacouſneſſe and Tranſparency, &c. why ſhould the favourers of this Opinion deny, That, in other Bodies beſides the Elements, Qualities may be preſerv'd and kept united to the Matter they belong to, without the Band or Support of a ſubſtantial Form? And as, when there is no competent deſtructive Cauſe, the Accidents of a Body will by the Law of Nature remain ſuch as they were;

were, ſo if there be, it cannot with reaſon be pretended, that the ſubſtantial Form is able to preſerve all thoſe Accidents of a Body, that are ſaid to flow from it, and to be as it were under its care and tuition; for if, for inſtance, you expoſe a Sphære or Bullet of Lead to a ſtrong fire, it will quickly looſe (not to mention its Figure) both its Coldneſs, its Conſiſtence, its Malleableneſs, its Colour, (for 'twill appear of the colour of fire,) its Flexibility, and ſome other Qualities, and all this in ſpight of the imaginary ſubſtantial Form, which, according to the Peripatetical Principles, in this caſe muſt ſtill remain in it without being able to help it. And though upon the taking the Lead from off the fire, it is wont to be reduc'd to moſt of its former Qualities, (for it will not of it ſelf recover its Sphæricity,) yet That may well be aſcrib'd partly to its peculiar Texture, and partly to the Coldneſs of the ambient Air, according to what we lately

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lately diſcourſ'd touching heated and refrigerated Water, which Temperature of the Air is an extrinſecal thing to the Lead, and indeed it is but Accidental, that the Lead upon refrigeration regains its former Qualities; for in caſe the Lead have been expoſ'd long enough to a ſufficiently intenſe fire, it will (as we have purpoſely try'd) be turn'd into Glaſſe, and looſe its colour, its opacity, its malleableneſs, and (former degree of) flexibleneſſe, and acquire a Reddiſhneſs, a degree of Tranſparency, a Brittleneſſe, and ſome other Qualities, that it had not before: and let the ſuppoſed ſubſtantial Form do what it can, even when the Veſſel is remov'd from the fire, to reduce or reſtore the Body to its Natural ſtate and Accidents, yet the former Qualities will remain loſt, as long as theſe Præternatural ones, introduc'd by the fire, continue in the Matter; and neither the one will be reſtor'd, nor the other deſtroy'd, till ſome ſufficiently powerful extrinſick Agent effect the Change. And on the other ſide I conſider, that the Fruit, when ſever'd from the Tree it grew on, is confeſſ'd to be no longer animated (at leaſt the Kernels, or Seeds excepted) by the Vegetative Soul, or ſubſtantial Form of the Plant; yet in an Orange or Lemmon (for inſtance) pluckt from the Tree, we ſee, that the ſame Colour, the ſame Odour, the ſame Taſt, the ſame Figure, the ſame Conſiſtence, and, for ought we know, the ſame other Qualities, whether ſenſible, or even occult, as are its Antidotal and Antiſcorbutical virtues, that muſt before be ſaid to have flow'd from the Soul of the Tree, will continue, many months, perhaps ſome years, after the fruit has ceaſ'd to have any commerce with the Tree, (nay though the Tree, whereon it grew, be perhaps in the mean time hewn down or burnt, and though conſequently its Vegetative Soul or Form be deſtroy'd,) as when it grew thereon, and made up one Plant with it. And we find, that Tamarinds, Rhubarb, Senna, and many other Simples will for divers years, after they have been depriv'd of their former Vegetative Soul, retain their Purgative and other Specifick properties.

I find it likewiſe urg'd, that there can be no Reaſon, why Whiteneſs ſhould be ſeparable from a Wall, and not from Snow or Milk; unleſſe we have recourſe to ſubſtantial Forms. But in caſe men have agreed to call a thing by ſuch a name, becauſe it has ſuch a particular Quality, that differences it from others, we need go no farther to find a Reaſon, why one Quality is eſſential to one thing, and not to another. As in our former example of a Braſs Sphære, the Figure is that, for which we give it that Name, and therefore, though you may alter the figure of the Matter, yet by that very alteration the Body periſhes in the capacity of a Sphære, whereas its

Coldneſs may be exchang'd for Heat, without the making it the leſs a Sphære, becauſe tis not for any ſuch Quality, but for Roundneſs, that a Body is ſaid to be a Sphære. And ſo Firmneſs is an inſeparable Quality of Ice, though this or that particular Figure be not, becauſe that tis for want of fluidity, that any thing, that was immediately before a Liquor, is call'd Ice; and congruouſly hereunto, though Whiteneſs were inſeparable from Snow and Milk, yet that would not neceſſarily infer, that there muſt be a ſubſtantial Form to make it ſo: for the Firmneſs of the Corpuſcles, that compoſe Snow, is as inſeparable from it, as the Whiteneſſe; and yet is not pretended to be the effect of the ſubſtantial Form of the Water, but of the exceſſe of the Coldneſſe of the Air, which (to uſe vulgar, though perhaps unaccurate, expreſſions,) puts the Water out of its Natural ſtate of Fluidity, and into a Præternatural one of

Firmneſs and Brittleneſs. And the reaſon, why Snow ſeldome looſes its whiteneſs but with its nature, ſeems to be, that its component Particles are ſo diſpoſ'd, that the ſame heat of the ambient Air, that is fit to turn it into a tranſparent Body, is alſo fit to make it a fluid one, which when it is become, we no longer call it Snow, but Water; ſo that the Water looſes its whiteneſs, though the Snow do not. But if there be a cauſe proper to make a convenient alteration of Texture in the Snow, without melting or reſolving it into water, it may then exchange its Whiteneſs for Yellowneſſe, without looſing its right to be call'd Snow; as, I remember, I have read in an eminent Writer, that *de facto* in the Northern Regions towards the Pole, thoſe parcels of Snow, that have lain very long on the ground, degenerate in time into a Yelowiſh colour, very differing from that pure Whiteneſs to be obſerv'd in the neighbouring

Snow lately fallen.

But there yet remains an Argument for ſubſtantial Forms, which though (perhaps becauſe Phyſical) wont to be overlook'd, or ſlightly anſwer'd by their Oppoſers, will for the ſame reaſon deſerve to be taken notice of here; and it is, That there ſeems to be a neceſſity of admitting ſubſtantial Forms in Bodies, that from thence we may derive all the various changes, to which they are ſubject, and the differing Effects they produce, [the Preſervation and Reſtitution of the State requiſite to each particular Body,] as alſo the keeping of its ſeveral parts united into one *Totum*. To the anſwering of this Argument, ſo many things will be found applicable, both in the paſt and ſubſequent parts of theſe Notes, that I ſhall at preſent but point the chief particulars, on which the Solution is grounded.

I conſider then firſt, that many and great Alterations may happen to Bodies,

dies, which ſeem manifeſtly to proceed from their peculiar Texture, and the Action of outward Agents upon them, and of which it cannot be ſhewn, that they would happen otherwiſe, though there were no ſubſtantial Forms *in rerum natura*: as we ſee that Tallow (for inſtance) being melted by the fire looſes its Coldneſs, Firmneſs, and its Whiteneſs, and acquires Heat, Fluidity, and ſome Tranſparency, all which, being ſuffer'd to cool, it preſently exchanges for the three firſt nam'd Qualities. And yet divers of theſe Changes are plainly enough the effects partly of the Fire, partly of the ambient Air, and not of I know not what ſubſtantial Form: and it is both evident and remarkable, what great variety of changes in Qualities, and Productions of new ones, the Fire (that is, a Body conſiſting of inſenſible parts, that are variouſly and vehemently mov'd) doth effect by its Heat, that is, *by a modify'd Local Motion*. I conſider further, that various Operations of a Body may be deriv'd from the peculiar Texture of the Whole, and the Mechanical Affections of the particular Corpuſcles or other parts that compoſe it, as we have often occaſion to declare here and there in this Treatiſe; and particularly by an Inſtance, ere long to be further inſiſted on, namely, that though Vitriol, made of Iron with a Corroſive liquor, be but a factitious Body, made by a convenient appoſition of the ſmall parts of the ſaline Menſtruum to thoſe of the Mettal, yet this Vitriol will do moſt, if not all, of the ſame things, that Vitriol, made by Nature in the bowels of the Earth, and digg'd out thence, will perform; and each of theſe Bodies may be endow'd with variety of differing Qualities, which I ſee not, why they muſt flow, in the native Vitriol, from a ſubſtantial Form, ſince in the factitious Vitriol, the ſame Qualities belong to a Form, that does plainly emerge from the coalition of Metalline and Saline Corpuſcles, aſſociated together and diſpoſ'd of after a certain manner.

And laſtly, as to what is very confidently, as well as plauſibly, pretended, That a ſubſtantial Form is requiſite to keep the parts of a Body united, without which it would not be one Body. I anſwer, That the contrivance of conveniently figur'd parts, and in ſome caſes their juxta-poſition, may without the aſſiſtance of a ſubſtantial Form be ſufficient for this matter; for not to repeat what I juſt now mention'd concerning Vitriol made by Art, whoſe Parts are as well united and kept together, as thoſe of the Native Vitriol, I obſerve, that a Pear grafted upon a Thorn, or a Plum inoculated upon an Apricock, will bear good fruit, and grow up with the Stock, as though they both made but one Tree, and were animated but by the ſame common Form; whereas indeed both the Stock and the inoculated or grafted Plant have each of them its own Form, as may appear by the differing leaves, and fruits, and ſeeds they bear. And that which makes to our preſent purpoſe is, that even Vegetation and the Diſtribution of Aliments are in ſuch caſes well made, though the nouriſh'd parts of the Total Plant, if I may ſo call it, have not one common Soul or Form; which is yet more remarkable in the Miſletoes, that I have ſeen growing upon old Hazletrees, Crab-trees, Apple-trees, and other plants, in which the Miſletoe often differs very widely from that kind of Plant on which it grows and proſpers. And for the durableneſſe of the Union betwixt Bodies, that a ſubſtantial Form is not requiſite to procure it, I have been induc'd to think by conſidering, that Silver and Gold, being barely mingl'd by Infuſion, will have their minute parts more cloſely united, then thoſe of any Plant or Animal that we know of. And there is ſcarce any

Natural Body, wherein the Form makes ſo ſtrict, durable, and indiſſoluble an Union of the parts it conſiſts of, as that, which, in that Factitious Concrete we call Glaſs, ariſes from the bare commiſtion of the Corpuſcles of Sand with thoſe Saline ones, wherewith they are colliquated by the violence of the fire: and the like may be ſaid of the Union of the proper Accidents of Glaſſe with the Matter of it, and betwixt one another.

To draw towards a Concluſion, I know tis alledg'd as a main Conſideration on the behalf of ſubſtantial Forms, that theſe being in Natural Bodies the true principles of their Properties, and conſequently of their Operations, their Natural Philoſophy muſt needs be very imperfect and defective, who will not take in ſuch Forms: but for my part I confeſs, that this very conſideration does rather indiſpoſe then incline me to admit them. For if indeed there were in every Natural Body ſuch a thing as a ſubſtantial Form, from which all its Properties and Qualities immediately flow, ſince we ſee that the Actions of Bodies upon one another are for the moſt part (if not all) immediately perform'd by their Qualities or Accidents, it would ſcarce be poſſible to explicate very many of the explicable *Phænomena* of Nature, without having recourſe to Them; and it would be ſtrange, if many of the abſtruſer *Phænomena* were not explicable by them onely. Whereas indeed almoſt all the rational Accounts to be met with of difficult *Phænomena*, are given by ſuch as either do not *acknowledge*, or at leaſt do not *take notice* of ſubſtantial Forms. And tis evident by the clear Solutions (untouch'd by many vulgar Philoſophers,) we meet with of many *Phænomena* in the Staticks, and other parts of the Mechanicks, and eſpecially in the Hydroſtaticks, and Pneumaticks, how clearly many *Phænomona* may be ſolv'd, without imploying a ſubſtantial Form. And on the other ſide, I do not remember, that either *Ariſtotle* himſelf, (who perhaps ſcarce ever attempted it,) or any of his Followers, has given a ſolid and intelligible ſolution of any one *Phænomenon* of Nature by the help of ſubſtantial Forms; which you need not think it ſtrange I ſhould ſay, ſince the greateſt Patrons of Forms acknowledg their Nature to be * unknown to Us, to explain any Effect by a ſubſtantial Form, muſt be to declare (as they ſpeak) *ignotum per ignotius*, or at leaſt *per æquè ignotum.* And indeed to explicate a *Phænomenon*, being to deduce it from ſomething elſe in Nature more known to Us, then the thing to be explain'd by It, how can the imploying of Incomprehenſible (or at leaſt Uncomprehended) ſubſtantial Forms help Us to explain intelligibly This or

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* *Nomina tu lapidis, qui quotidie tuis oculis obſervatur, formam, & Phyllida ſolus habeto. Scal. contra Card.*

That particular *Phænomenon?* For to ſay, that ſuch an Effect proceeds not from this or that Quality of the Agent, but from its ſubſtantial Form, is to take an eaſie way to reſolve all difficulties in general, without rightly reſolving any one in particular; and would make a rare Philoſophy, if it were not far more eaſie then ſatisfactory: for if it be demanded, why Jet attracts Straws, Rhubarb purges Choller, Snow dazles the Eyes rather then Graſſe, &c. to ſay, that theſe and the like Effects are perform'd by the ſubſtantial Forms of the reſpective Bodies, is at beſt but to tell me, what is the Agent, not how the Effect is wrought; and ſeems to be but ſuch a kind of general way of anſwering, as leaves the curious Enquirer as much to ſeek for the *cauſes* and *manner* of particular Things, as Men commonly are for the particular cauſes of the ſeveral ſtrang Things perform'd by Witchcraft, though they be told, that tis ſome Divel that does them all. Wherefore I do not think, but that Natural Philoſophy, without being for That the more Defective, may well enough ſpare the Doctrine of Subſtantial Forms as an uſeleſs Theory; not that Men are yet arriv'd to be able to explicate all the *Phænomena* of Nature without them, but becauſe, whatever we cannot explicate without them, we cannot neither intelligibly explicate *by* them.

And thus, *Pyrophilus*, I have offer'd You ſome of thoſe many things, that indiſpoſ'd me to acquieſce in the receiv'd Doctrine of Subſtantial Forms; but in caſe any more piercing Enquirer ſhall perſwade himſelf, that he underſtands it throughly, and can explicate it clearly, I ſhall congratulate him for ſuch happy Intellectuals, and be very ready to be inform'd by him. But ſince what the Schools are wont to teach of the Origine and Attributes of ſubſtantial Forms, is that, which, I confeſs, I cannot

not yet comprehend; and ſince I have ſome of the eminenteſt Perſons among the Modern Philoſophers to joine with me, though perhaps not for the ſame Conſiderations, in the like confeſſion, that tis not neceſſary the Reaſon of my not finding this Doctrine conceivable, muſt be rather a Defectiveneſs in my Underſtanding, then the unconceivable nature of the thing it ſelf: I, who love not (in matters purely Philoſophical) to acquieſce in what I do not underſtand, nor to go about to explicate things to others, by what appears to me it ſelf inexplicable, ſhall, I hope, be excuſ'd, if, leaving thoſe that contend for them, the liberty of making what uſe they can of ſubſtantial Forms, I do, till I be better ſatisfied, decline imploying them my ſelf, and endeavour to ſolve thoſe *Phænomena*, I attempt to give an account of, without them, as not ſcrupling to confeſs, that thoſe that I cannot explicate, at leaſt in a general way, by intelligible principles, I am not yet arriv'd to the diſtinct and particular knowledg of.

Now for our Doctrine touching the Origine of Forms, it will not be difficult to collect it from what we formerly diſcourſ'd about Qualities and Forms together: for the Form of a Natural Body, being according to us, but an Eſſential Modification, and, as it were, the *Stamp* of its Matter, or ſuch a convention of the Bigneſs, Shape, Motion (or Reſt,) Scituation and Contexture, (together with the thence reſulting Qualities) of the ſmall parts that compoſe the Body, as is neceſſary to conſtitute and denominate ſuch a particular Body; and all theſe Accidents being producible in Matter by Local Motion, tis agreeable to our *Hypotheſis* to ſay, That the firſt and Univerſal, though not immediate cauſe of Forms is none other but God, who *put Matter into Motion*, (which belongs not to its Eſſence,) and *Eſtabliſh'd the Laws of Motion* amongſt

Bodies, and alſo, according to my Opinion, *guided it in divers caſes at the beginning of Things*; and that, among Second Cauſes, the Grand Efficient of Forms is *Local Motion*, which by variouſly dividing, ſequeſtring, tranſpoſing, and ſo connecting the parts of Matter, produces in them thoſe Accidents and Qualities, upon whoſe account the portion of Matter they diverſifie comes to belong to this or that determinate *ſpecies* of Natural Bodies, which yet is not ſo to be underſtood, as if *Motion* were onely an Efficient cauſe in the Generation of Bodies, but very often (as in water, fire, &c.) tis alſo one of the chiefe *Accidents*, that concurre to make up the Form.

But in this laſt Summary Account of the Origine of Forms, I think my ſelf oblig'd to declare to you a little more diſtinctly, what I juſt now intimated to be my own Opinion. And this I ſhall do, by advertiſing you, that though I agree with our *Epicureans*, in thinking it probable, that the World is made up of an innumerable multitude of ſingly inſenſible Corpuſcles, endow'd with their own Sizes, Shapes, and Motions; and though I agree with the *Carteſians*, in believing (as I find that * *Anaxagoras* did of Old,) that Matter hath not its Motion from its ſelf, but Originally from God; yet in This I differ both from *Epicurus* and *Des Cartes*, that, whereas the former of them plainly denies, that the World was made by any Deity, (for Deities he own'd,) and the Latter of them, for ought I can find in his Writings, or thoſe of ſome of his Eminenteſt Diſciples, thought, that God, having once put Matter into Motion, and eſtabliſh'd the Laws of that Motion, needed not more particularly interpoſe for the Production of Things Corporeal, nor even of Plants or Animals, which according to him are but Engines: I do not at all believe, that either theſe *Carteſian Laws of Motion*, or the *Epicurean caſual Concourſe* of Atoms, could bring meer Matter into ſo orderly and well contriv'd a Fabrick as This World; and therefore I think, that the wiſe Author of Nature did not onely *put Matter into Motion*, but when he reſolv'd to make the World, did ſo regulate and *guide the Motions* of the ſmall parts of the Univerſal Matter, as to reduce the greater Syſtems of them into the Order they were to continue in; and did more particularly contrive ſome portions of that Matter into Seminal Rudiments or Principles, lodg'd in convenient Receptacles, (and as it were Wombs,) and others into the Bodies of Plants and Animals: one main part of whoſe Contrivance, did, as I apprehend, conſiſt in this, That ſome of their Organs were ſo fram'd, that, ſuppoſing the Fabrick of the greater Bodies of the Univerſe, and the Laws he had eſtabliſh'd in Nature, ſome Juicy and Spirituous parts of theſe living Creatures muſt be fit to be turn'd into Prolifick Seeds, whereby they may have a power, by generating their like, to propagate their *Species*. So that according to my apprehenſion, it was *at the beginning* neceſſary, that an Intelligent and Wiſe Agent ſhould contrive the Univerſal Matter into the World, (and eſpecially ſome Portions of it into Seminal Organs and Principles,) and ſettle the Laws, according to which the Motions and Actions of its parts upon one another ſhould be regulated: without which interpoſition of the Worlds Architect, however *moving Matter* may with ſome *probability* (for I ſee not in the Notion any Certainty) be conceiv'd to be able, after numberleſs Occurſions of its inſenſible parts, to caſt it ſelf into ſuch grand Conventions and Convolutions, as the Carteſians call *Vortices*, and as, I remember, [*] *Epicurus* ſpeaks of under the name of περιστάσεις, καὶ δινήσεις; yet I think it utterly improbable, that *brute* and *unguided*, though *moving*, Matter, ſhould ever convene into ſuch admirable Structures, as the Bodies of perfect Animals. But the World being once fram'd, and the courſe of Nature eſtabliſh'd, the Naturaliſt, (except in ſome few caſes, where God, or Incorporeal Agents interpoſe,) has recourſe to the firſt Cauſe but for its general and ordinary Support and Influence, whereby it preſerves Matter and Motion from Annihilation or Deſition; and in explicating *particular Phænomena*, conſiders onely the *Size, Shape, Motion,* (or *want of it*) *Texture*, and the reſulting Qualities and Attributes of the ſmall particles of Matter. And thus in this great *Automaton* the World, (as in a Watch or Clock,) the Materials it conſiſts of, being left to themſelves, could never at the firſt convene into ſo curious an Engine: and yet, when the skilful Artiſt has once made and ſet it a going, the *Phænomena* it exhibits are to be accounted for by the *number*, *bigneſſe*, *proportion*, *ſhape*, *motion*, (or *endeavour*,) *reſt*, *coaptation*, and other Mechanical Affections of the Spring, Wheels, Pillars, and other parts it is made up of: and thoſe effects of ſuch a Watch, that cannot this way be explicated, muſt, for ought I yet know, be confeſſ'd, not to be ſufficiently underſtood.

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* *Ariſtotle* ſpeaking of *Anaxagoras* in the firſt Ch. of the laſt Book of his Phyſicks, hath this paſſage: *Dicit* (*Anaxagoras*) *cùm omnia ſimul eſſent, atque* quieſcerent *tempore infinito, Mentem* moviſſe, *ac ſegregaſſe.*

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[*] *Epicurus* in his Epiſtle to *Pythocles*.

But to return thither, whence my Duty to the Author of Nature oblig'd me, to make this ſhort Digreſſion.

The hitherto propoſ'd *Hypotheſis*, touching the Origination of Forms, *hath*, I hope, been rendred probable by divers particulars in the paſt Diſcourſes, and *will* be both exemplify'd and confirm'd by ſome of the Experiments, that make the Latter part of this preſent Treatiſe, (eſpecially the Fifth and 7th of them,) which, containing Experiments of the Changing the Form of a Salt and a Mettal, do chiefly belong to the Hiſtorical or Experimental part of what we deliver touching the Origine of Forms. And indeed, beſides the *two kinds* of Experiments preſently to be mention'd, we might here preſent you a Third ſort, conſiſting *partly* of divers Relations of Metalline Tranſmutations, deliver'd upon their own Credit by Credible men, that are not Alchymiſts; and *partly* of ſome Experiments (ſome made, ſome directed by us) of Changing both Bodies, totally *inflammable*, almoſt totally into *Water*, and a good part ev'n of *diſtill'd Rain water* without Additament into *Earth*; and diſtill'd Liquors, readily and totally mingleable with Water, *pro parte* into a true *Oyle*, that will not mix with it. This ſort of Experiments, I ſay, I might here annex, if I thought fit, in this place, either to lay any ſtreſſe upon thoſe, that I cannot my ſelf make out, or to tranſfer hither thoſe Experiments of Changes amongſt Bodies not Metalline, that belong to another *Treatiſe. But over and above, what the paſt Notes and the Experiments, that are to follow them, contain towards the making of what we teach concerning Forms, we will here, for further Confirmation, proceed to adde two ſorts of Experiments, (beſides the Third already mention'd.) *The one*, wherein it appears, that Bodies of very differing Natures, being put together, like the Wheels, and other peices of a Watch, and by their connection acquiring a new Texture, and ſo new Qualities, may, without having recourſe to a ſubſtantial Form, compoſe ſuch a new Concrete, as may as well deſerve to have a ſubſtantial Form attributed to it, by virtue of that new Diſpoſition of its parts, as other Bodies that are ſaid to be endow'd therewith. And the *other*, that a Natural Body being diſſipated, and as it were taken in peices, like a Watch, may have its parts ſo aſſociated, as to conſtitute New Bodies, of Natures very differing from its own, and from each other; and yet theſe diſſipated and ſcatter'd parts, by being recollected and put together again, like the pieces of a Watch, in the like order as before, may recompoſe (almoſt, if not more then almoſt) ſuch another Body, as that they made up, before they were taken aſunder.

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* The Sceptical Chymiſt.

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EXPE-

I.

EXPERIMENTS, and THOUGHTS, about the *Production* and *Reproduction* of *FORMS*.

IT was not at randome, that I ſpoke, when, in the foregoing Notes about the Origine of Qualities, I intimated, That 'twas very much by a kind of tacit agreement, that Men had diſtinguiſh'd the *Species* of Bodies, and that thoſe Diſtinctions were more Arbitrary then we are wont to be aware of. For I confeſſe, that I have not yet, either in *Ariſtotle*, or any other Writer, met with any genuine and ſufficient Diagnoſtick and Boundary, for the Diſcriminating and limiting the *Species* of Things,or to ſpeak more plainly, I have not found, that any Naturaliſt has laid down a determinate Number and ſort of Qualities, or other Attributes, which is *ſufficient* and *neceſſary* to conſtitute all portions of Matter, endow'd with them, diſtinct Kinds of Natural Bodies. And therefore I obſerve, that moſt commonly Men look upon theſe as Diſtinct *Species* of Bodies, that have had the luck to have diſtinct Names found out for them; though perhaps diverſe of them differ much leſſe from one another, then other Bodies, which (becauſe they have been hudled up under one Name,) have been look'd upon, as but one ſort of Bodies. But not to lay any weight on this Intimation about Names, I found, that for want of a true Characteriſtick,or diſcriminating notes, it hath been, and is ſtill, both very *uncertain* as to divers Bodies,whether they are of different *Species* or of the ſame, and very *difficult* to give a ſufficient reaſon, why divers Bodies, wherein Nature is aſſiſted by Art, ſhould not as well paſs for diſtinct kinds of Bodies, as others, that are generally reckon'd to be ſo.

Whether (for inſtance) Water and Ice be not to be eſteem'd diſtinct kinds of Bodies, is ſo little evident, that ſome, that pretend to be very well verſ'd in *Ariſtotle's* Writings and Opinions, affirme him to teach, that Water looſes not its own nature by being turn'd into Ice; and indeed I remember I have read a [*] Text of his, that ſeems expreſs enough to this purpoſe, and the thing it ſelf is made plauſible by the reducibleneſſe of Ice back again into Water. And yet I remember, *Galen* is affirm'd to make theſe two, diſtinct *Species* of Bodies; which Doctrine is favour'd by the differing Qualities of Ice and Water, for not onely the one is fluid, and the other ſolid, and even brittle, but Ice is alſo commonly more or leſs opacous in compariſon of Water, being alſo lighter then it *in ſpecie*, ſince it ſwims upon it. To which may be added, that Ice, beaten with common Salt, will freez other Bodies, when Water mingled with Salt will not. And on this occaſion, I would propoſe to be reſolv'd, whether Muſt, Wine, Spirit of Wine, Vinegar, Tartar, and Vappa, be Specifically diſtinct Bodies? and the like queſtion I would ask concerning a Hens Egg, and the Chick that is afterwards hatch'd out of it: As alſo concerning Wood, Aſhes, Soot, and likewiſe the Eggs of Silkworms, which are firſt ſmall Caterpillars, or (as ſome think them) but Worms, when they are newly hatch'd, and then *Aurelia's*, (or husked Maggots,) and then Butterflies, which I have obſerv'd with pleaſure to be the ſucceſſive Production of the Prolifick Seed of Silkworms. And whether the Anſwer to theſe Quæries be Affirmative or Negative, I doubt the reaſon, that will be given for either of the two, will not hold in divers caſes, whereto I might apply it. And a more puzling Queſtion it may be to ſome, whether a Charcoal, being throughly kindled, do ſpecifically differ from another Charcoal? for, according to thoſe I argue with, the fire has *penetrated* it quite through; and therefore ſome of the recent *Ariſtotelians* are ſo convinc'd of its being tranſmuted, that all the ſatisfaction I could find from a very ſubtle modern Schoolman to the Objection, That if the glowing Coal were plung'd into Water, it would be a black Coal agen, was, That notwithſtanding That reduction, the Form of a Charcoal had been once aboliſh'd by the fire, and was reproduc'd by God, upon the regain'd Diſpoſition of the Matter to receive it.

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[*] See *Lib.* 1. *de Gen. & Cor. t.* 80. Idem Corpus (ſayes he there) *quanquam continuum, aliàs liquidum, aliàs concretum videmus, non diviſione aut compoſitione hoc paſſum, aut converſione, aut attactu, ſicuti Democritus aſſerit: nam neque tranſpoſitione, neque* Naturæ demutatione (*ἐ τὸ μεταβάλλον τὴν φύσιν*) *ex liquido concretum evadere ſolet.*

Nor is it very eaſie to determine, whether Clouds, and Rain, and Hail, and Snow, be bodies ſpecifically diſtinct from Water, and from each other, and the writers of Meteors are wont to handle them as diſtinct. And ſince if ſuch ſlight differences as thoſe, that diſcriminate theſe Bodies, or that which diſtinguiſhes Wind from Exhalations, whoſe Courſe makes it, be ſufficient to conſtitute differing kinds of Bodies, 'twill be hard to give a ſatisfactory Reaſon, why other Bodies, that differ in more or more conſiderable particulars, ſhould not enjoy the ſame Priviledge. And I preſume, that Snow differs leſs from Rain, then Paper doth from Rags, or Glaſs made of Wood-aſhes does from Wood. And indeed, Men having, by tacit conſent, agreed to look upon Paper, and Glaſs, and Soape, and Sugar, and Braſs, and Ink, and Pewter, and Gunpowder, and I know not how many others, to be diſtinct ſorts of Bodies, I ſee not, why they may not be thought to have done it, on as good grounds, as thoſe, upon which divers other differing *Species* of Bodies have been conſtituted. Nor will it ſuffice to object, that theſe Bodies are *factitious*; for 'tis the preſent nature of Bodies, that ought to be conſider'd in referring them to *Species*, which way ſoever they came by that Nature: for Salt, that is, in many Countries, made by boiling Sea water in Cauldrons, and other veſſels, is as well true Sea-ſalt, as that which is made in the Iſle of *Man*, (as Navigators call it,) without any cooperation of Man, by the bare action of the Sun upon thoſe parts of the Sea water, which chance to be left behind in hollow places, after a high Spring-tide. And Silk-worms, which will hatch by the heat of humane Bodies, and Chickens, that are hatch'd in *Ægypt* by the heat of Ovens or Dunghils, are no leſs true Silk-worms or Chickens, then thoſe that are hatch'd by the Sun, or by Hens.

As for what may be objected, that we muſt diſtinguiſh betwixt Factitious Bodies and Natural, I will not now ſtay to examine, how far that Diſtinction may be allow'd: for it may ſuffice for our preſent purpoſe to repreſent, that whatever may be ſaid of Factitious Bodies, where Man does, by Inſtruments of his own providing, onely give Figure, or alſo Contexture to the *ſenſible* (not inſenſible) parts of the Matter he works upon; as when a Joyner makes a Stool, or a Statuary makes an Image, or a Turner a Bowl: yet the caſe may be very differing in thoſe other factitious Productions, wherein the *inſenſible* parts of Matter are alter'd by Natural Agents, who perform the greateſt part of the work among themſelves, though the Artificer be an Aſſiſtant, by putting Them together after a due manner. And therefore I know not, why all the Productions of the Fire made by Chymiſts ſhould be look'd upon, as not Natural, but Artificial Bodies: ſince the Fire, which is the grand Agent in theſe Changes, doth not, by being imploy'd by the Chymiſt, ceaſe to be, and to work as, a Natural Agent. And ſince Nature her ſelf doth, by the help of the fire, ſometimes afford us the like Productions that the Alchymiſts art preſents us: as in *Ætna*, *Veſuvius*, and other burning Mountains, (ſome of whoſe Productions I can ſhew you,) Stones are ſometimes turn'd into Lime, (and ſo an Alcalizate Salt is produc'd,) and ſometimes, if they be more diſpoſ'd to be flux'd, then calcin'd, brought to vitrification; Metalline and Mineral Bodies are by the violence of the fire colliquated into Maſſes of very ſtrange and compounded Natures. Aſhes and Metalline flowers of divers kinds are ſcatter'd about the neighbouring places, and copious flowers of Sulphur, ſublim'd by the internal fire, have been ſeveral times found about the Vents, at which the Fumes are diſcharg'd into the Air: (As I have been aſſur'd by Ingenious Viſiters of ſuch Places, whom I purpoſely inquir'd of, touching theſe *flores*; for of theſe Travellers more then one anſwer'd me, they had themſelves gather'd, and had brought ſome very good.) Not to adde, that I have ſometimes ſuſpected, upon no abſurd grounds, that divers of the Minerals and other Bodies, we meet with in the lower parts of the Earth, and think to have been formed and lodg'd there ever ſince the beginning of Things, have been ſince produc'd there by the help of ſubterraneal fires, or other heats, which may *either* by their immediate action, and exceedingly long application, very much alter ſome Bodies by changing their Texture; as when Lead is turn'd into Minium, and Tin into Putty by the operation of the fire in a few hours, *or* by elevating, in the form of Exhalations or Vapours, divers Saline and Sulphureous Corpuſcles or Particles of unripe (or to uſe a Chymical Term of Art) Embrionated Minerals, and perhaps Mettals, which may very much alter the Nature, and thereby vary the Kind of other ſubterraneal Bodies, which they pervade, and in which they often come to be incorporated; *or elſe* may, by convening among themſelves, conſtitute particular Concretions, as wee ſee that the fumes of Sulphur and thoſe of Mercury unite into that Lovely red Maſs, which in the Shops they call Vermilion, and which is ſo like to the Mineral, whence we uſually obtain Mercury, that the *Latines* give them both the ſame Name *Cinnabaris*, and in that are imitated by the French and Italians; in whoſe favour I ſhall adde, That if we ſuppoſe this Mineral to conſiſt of a ſtony Concretion, penetrated by ſuch Mineral fumes as I have been ſpeaking of, the

Appellation may be better excuſ'd then perhaps you imagine, ſince from *Cinnabaris nativa* not onely I obtain'd a conſiderable quantity of good running Mercury, (which is That, Men are wont to ſeek for from it,) but to gratifie my Curioſity ſomewhat further, I try'd an eaſie way, that came into my mind, whereby the *Caput mortuum* afforded me no deſpicable Quantity of good combuſtible Sulphur. But this upon the By, being not oblig'd to ſet down here the grounds of my Paradoxical Conjecture about the Effects of ſubterraneal Fires and Heats, ſince I here lay no ſtreſs upon it, but return to what I was ſaying about *Ætna*, and other Volcans. Since then theſe Productions of the Fire, being of Nature's own makeing, cannot be deny'd to be Natnral Bodies, I ſee not why the like Productions of the Fire ſhould be thought unworthy that Name, onely becauſe the Fire, that made the former, was kindled by chance in a Hill, and that which produc'd the latter was kindled by a Man in a Furnace. And if flower of Sulphur, Lime, Glaſs, and colliquated mixtures of Metals and Minerals are to be reckon'd among Natural Bodies, it ſeems to be but reaſonable, that, upon the ſame grounds, we ſhould admit flower of Antimony, Lime, and Glaſs, and Pewter, and Braſs, and many other Chymical Concretes, (if I may ſo call them) to be taken into the ſame number; and then 'twill be evident, that to diſtinguiſh the *ſpecies* of Natural Bodies, a Concourſe of Accidents will, without conſidering any Subſtantial Form, be ſufficient.

But becauſe I need not, on this occaſion, have recourſe to inſtances of a diſputable nature, I will pitch, for the illuſtration of the Mechanical Production of Forms, upon Vitriol. For ſince Nature her ſelf, without the help of Art, does oftentimes produce that Concrete, (as I have elſewhere ſhewn by Experience,) there is no reaſon why Vitriol, produc'd by eaſie Chymical Operations, ſhould not be look'd upon as a Body of the ſame Nature and Kind. And in Factitious Vitriol, our knowing what Ingredients we make uſe of, and how we put them together, inables us to judge very well, how Vitriol is produc'd. But becauſe it is wont to be reckon'd with Salt-petre, Sea-ſalt, and Sal Gem among true Salts, I think it requiſite to take notice in the firſt place, that Vitriol is not a meer Salt, but That, which *Paracelſus* ſomewhere, and after him divers other Spagyriſts, call a Magiſtery, which in their ſenſe (for there are that uſe it in another,) commonly ſignifies a Preparation, wherein the Body to be prepar'd has not its *Principles ſeparated*, as in Diſtillation, Incineration, &c. but wherein the *whole Body* is brought into another form, by the *addition* of ſome Salt or Menſtruum, that is united *per minima* with it. And agreeably to this Notion we find, that from common Vitriol, whether native or factitious, may be obtain'd (by Diſtillation and Reduction) an acid Saline Spirit, and a Metalline Subſtance, as I elſewhere mention, that from blew Vitriol, Copper may be (by more then one way) ſeparated. And I the rather give this Advertiſement, becauſe that *as* there is a Vitriol of Iron, which is uſually green; and another of Copper, which is wont to be blew; and alſo a white Vitriol, about which it is diſputed what it holds, (though that it holds ſome Copper I have found;) and yet all of theſe are without ſcruple reputed true Vitriols, notwithſtanding that they differ ſo much in Colour, and (as I have diſcover'd) in ſeveral other Qualities; *ſo* I ſee no reaſon, why the other Minerals, being reduc'd by their proper Menſtruums into Salt like Magiſteries, may not paſs for the Vitriols of thoſe Metals, and conſequently for Natural Bodies: which, if granted, will adde ſome confirmation to our Doctrine, though its being granted is not neceſſary to make it out. For, to confine our ſelves to Vitriol, 'tis known among Chymiſts, that if upon the filings of *Mars* one put a convenient quantity of that acid diſtill'd Liquor, which is (abuſively) wont to be call'd Oyl of Vitriol, diluting the mixture with Rain, or with common Water, 'tis eaſie by Filtrating the Solution, by Evaporating the Aqueous ſuperfluity of it, and by leaving the reſt for a competent while in a Cellar, (or other cold place) to Chriſtallize, 'tis eaſie, I ſay, by this means to obtain a Vitriol of Iron; which agrees with the other Vitriol of Vitriol-ſtones or Marchaſites, preſented us, by Nature, without the help of any other Menſtruum, then the Rain that falls upon them from the Clouds, in I know not how many Qualities, part Obvious, and part of them Occult: As, (of the *firſt ſort*) in Colour, Tranſparency, Brittleneſſe, eaſineſs of Fuſion, Styptical Taſt, reducibleneſs to a Red Powder by Calcination, and other Qualities more obvious to be taken notice of; to which may be annex'd divers Qualities of the *ſecond ſort*, (I mean the more abſtruſe ones,) as the power to turn in a trice an Infuſion of Galls, made in ordinary water, (as alſo to turn a certain clear Mineral Solution, elſewhere mention'd,) into an Inckly colour, to which, in all probability, we may adde a faculty of cauſing Vomits even in a ſmall Doſe, when taken into the Stomach of a Man, and that remarkable property of being endow'd with as exact and curious a ſhape or figure, as Thoſe, for which Salts have been, by modern Philoſophers eſpecially, ſo much admir'd. But, that no ſcruple might ariſe from hence, that in the *Vitriolum Martis*, wont to be made by Chymiſts, the Menſtruum, that is imploy'd, is the Oyl of common Vitriol, which may be ſuſpected to have retain'd the nature of the Concrete whence it proceeded, and ſo this Factitious Vitriol may not be barely a new Production, but partly a Recorporification, as they ſpeak, of the Vitriolate Corpuſcles contain'd in the Menſtruum: To prevent this Scruple I ſay, (which yet perhaps would not much trouble a Conſidering Chymiſt,) I thought fit to imploy a quite other Menſtruum, that would not be ſuſpected to have any thing of Vitriol in it. And though *Aqua fortis*, and Spirit of Nitre, however they *corrode* Mars, are unfit for ſuch a work, yet having pitch'd upon Spirit of Salt inſtead of Oyl of Vitriol, and proceeding the ſame way that has been already ſet down, it anſwer'd our Expectation, and afforded us a good green Vitriol. Nor will the great diſpoſition, I have obſerv'd in this our Vitriol, to reſolve, by the moiſture of the Air, into a Liquor, make it eſſentially differing from other Vitriols, ſince it has been obſerv'd, and particularly by *Guntherus Belichius* more then once, that even the common Vitriol he uſ'd in *Germany*, will alſo, though not ſo eaſily as other Salts, run (as the Chymiſts phraſe it) *per deliquium*. And to make the Experiment more compleat, though we did not find either Oyl of Vitriol, or Spirit of Salt, good Menſtruums to make a blew Venereal Vitriol out of Copper, (however fil'd, or thinly laminated,) and though upon more Tryals then one, it appear'd, that *Aqua fortis*, & Spirit of Nitre, which we thought fit to ſubſtitute to the above mention'd Liquors, did indeed make a Solution of Copper, but ſo unctuous a one, that twas very hard to bring any part of it to dryneſſe, without ſpoyling the Colour and Shape of the deſir'd Body: yet repeating the Experiment with care and watchfulneſs, we, this way, obtain'd one of the loveliest Vitriols that hath perhaps been ſeen, and of which you your ſelf may be the judg by a parcel of it I keep by me for a Rarity.

To apply now theſe Experiments, eſpecially That, wherein Spirit of Salt is imploy'd, to the purpoſe, for which I have mention'd them,let us briefly conſider theſe two things; the one, that our Factitious Vitriol is a Body, that, as well as the Natural, is endow'd with many Qualities, (manifeſt, and occult,) not onely ſuch as are common to it with other Salts, as Tranſparency, Brittleneſs, Solublenеſſe in Water, &c. but ſuch as are Properties peculiar to it, as Greenneſs, eaſineſs of Fuſion, Stypticity of Taſt, a peculiar Shape, a power to ſtrike a Black with infuſion of Galls, an Emetick faculty, &c.

The other thing we are to conſider is, that though theſe Qualities are in common Vitriol believ'd to flow from the ſubſtantial Form of the Concrete, and may, as juſtly as the Qualities, whether manifeſt or occult, of other Inanimate Bodies, be imploy'd as Arguments to evince ſuch a Form: yet in our Vitriol, made with Spirit of Salt, the ſame Qualities and Properties were produc'd by the aſſociating and juxtapoſition of the two Ingredients, of which the Vitriol was compounded, the Myſtery being no more but this, That the Steel being diſſolv'd in the Spirit, the Saline Particles of the former, and the Metalline ones of the latter, having each their Determinate Shapes, did by their Aſſociation compoſe divers Corpuſcles of a mix'd or compounded Nature, from the Convention of many whereof, there reſulted a new Body, of ſuch a Texture, as qualify'd it to affect our Senſories, and work upon other Bodies, after ſuch a manner as common Vitriol is wont to do. And indeed in our caſe, not onely it cannot be made appear, that there is any ſubſtantial Form generated anew, but that there is not ſo much as an exquiſite mixture, according to the common Notion the Schools have of ſuch a Mixture. For Both the Ingredients retain their Nature, (though perhaps ſomewhat alter'd,) ſo that there is, as we were ſaying, but a Juxta-poſition of the Metalline and Saline Corpuſcles; onely they are aſſociated ſo, as by the mannner of their Coalition to acquire that new Texture, which Denominates the Magiſtery they compoſe, Vitriol. For 'tis evident, that the Saline Ingredient may either totally, or for much the greateſt part be ſeparated by Diſtillation, the Metalline remaining behind. Nay ſome of the Qualities, we have been aſcribing to our Vitriol, do ſo much depend upon Texture, that the very Beams of the Sun (converg'd) will, as I have purpoſely try'd, very eaſily alter its Colour, as well as ſpoyl its Tranſparency, turning it at firſt from Green to White, and, if they be concenter'd by a good Burning glaſs, makeing it change that Livery for a deep Red.

Doubts and Experiments, touching the Curious Figures of SALTS.

AND here let me take notice, that though the exact and curious Figures, in which Vitriol and other Salts are wont to ſhoot, be made Arguments of the *Preſence*, and great Inſtances of the *Plaſtick skill* of ſubſtantial Forms and Seminal Powers, yet, I confeſs, I am not ſo fully ſatisfied in this matter, as even the Modern Philoſophers appear to be. 'Tis not that I deny, that *Plato*'s excellent Saying, γεωμετρεῖ ὁ Θεὸς, may be apply'd to theſe exquiſite Productions of Nature. For though God has thought fit to make things Corporeal after a much more facile and intelligible way, then by the intervention of ſubſtantial Forms; and though the Plaſtick

ſtick power of Seeds, which in Plants and Animals I willingly admit, ſeem not in our caſe to be needful; yet is the Divine Architect's Geometry (if I may ſo call it) neverthele{ſſ}e to be acknowledg'd and admir'd; for having been pleaſ'd to make the *primary* and inſenſible Corpuſcles of Salts and Metals of ſuch determinate, curious, and exact Shapes, that, as they happen to be aſſociated together, they ſhould naturally produce Concretions, which, though *differingly* figur'd according to the reſpective Natures of their Ingredients, and the various manners of their Convening, ſhould yet be all of them very *curious*, and ſeem elaborate in their Kinds. How little I think it fit to be allow'd, that the Bodies of Animals, which conſiſt of ſo many curiouſly fram'd and wonderfully adapted Organical parts, (and whoſe Structure is a thouſand times more Artificial then that of Salts, and Stones, and other Minerals,) can be reaſonably ſuppoſ'd to have been produc'd by Chance, or without the Guidance of an Intelligent Author of Things, I have elſewhere largely declar'd. But I confeſs, I look upon theſe Figures we admire in Salts, and in ſome kinds of Stones, (which I have not been Incurious to collect,) as Textures ſo ſimple and ſlight in compariſon of the Bodies of Animals, & oftentimes in compariſon of ſome one Organical part, that I think it cannot be in the leaſt inferr'd, that becauſe ſuch ſlight Figurations need not be aſcrib'd to the Plaſtick power of Seeds, it is not neceſſary, that the ſtupendious and incomparably more elaborate Fabrick and ſtructure of Animals themſelves ſhould be ſo. And this premiſ'd, I ſhall adde, that I have been inclin'd to the Conjecture about the ſhapes of Salts, that I lately propoſ'd, by theſe Conſiderations.

Firſt, That by a bare Aſſociation of Metalline and Saline Corpuſcles, a Concrete, as finely figur'd as other Vitriols, may be produc'd, as we have lately ſeen.

Secondly, becauſe that the Figures of theſe Salts are not conſtantly in all reſpects the ſame, but may in diverſe manners be ſomewhat varied, as they happen to be made to ſhoot more haſtily, or more leiſurely, and as they ſhoot in a ſcanter, or in a fuller proportion of Liquor. This may be eaſily obſerv'd by any, that will but with a little Attention conſider the difference that may be found in Vitriolate Chriſtals or Grains, when quantities of them were taken out of the great Coolers, as they call them, wherein that Salt, at the Works where tis boyl'd, is wont to be ſet to ſhoot. And accordingly, where the Experienc'd Mineraliſt *Agricola*, deſcribes the ſeveral wayes of making Vitriol in great Quantities, he does not onely more then once call the great Grains or Chriſtals, into which it coagulates, Cubes; but ſpeaking of the manner of their

Concretion about the Cords or Ropes, that are wont (in *Germany*) to be hang'd from certain croſs Bars into the Vitriolate Water or Solution for the Vitriol to faſten its ſelf to; he compares the Concretions indifferently to Cubes or Cluſters of Grapes: *Ex his* (ſayes he, ſpeaking of the croſs Bars,) *pendent reſtes lapillis extentæ, ad quos humor ſpiſſus adhæreſcens denſatur in tranſlucentes atramenti ſutorii vel Cubos, vel Acinos, qui uvæ ſpeciem gerunt.* I remember alſo, that having many years ſince a ſuſpicion, that the Reaſon why *Alkalys*, ſuch as Salt of Tartar and Pot-aſhes are wont to be obtain'd in the form of white Powders or *Calces*, might be the way, wherein the Water, or the Lixiviums, that contain them, is wont to be drawn off, I fancied, that by leaving the Saline Corpuſcles a competent quanti- of Water to ſwimme in, and allowing them leaſure for ſuch a multitude of

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* *Georg: Agricola de re metall. lib.* 12.*p.* 462.

Occurſions, as might ſuffice to make them hit upon more congruous Coalitions then is uſual, I might obtain Chriſtals of Them, as well as of other Salts: conjecturing this, I ſay, I cauſ'd ſome well purify'd *Alkalys*, diſſolv'd in clear water, to be ſlowly evaporated, till the Top was cover'd with a thin Ice-like Cruſt, then taking care not to break That, leaſt they ſhould (as in the ordinary way, where the Water is all forc'd off,) want a ſufficient ſtock of Liquor, I kept them in a very gentle heat for a good while; and then breaking the above mentioned Ice-like Cake, I had, as I wiſh'd, divers figured Lumps of Chriſtalline Salt ſhot in the Water, and tranſparent almoſt like white Sugar Candy.

I likewiſe remember, that having, on ſeveral occaſions, diſtill'd a certain quantity of Oyl of Vitriol, with a ſtrong Solution of Sea-ſalt, till the remaining Matter was left dry, that Saline Reſidue

due being diſſolv'd in fair water, filter'd, and gently evaporated, would ſhoot into Chriſtals, ſometimes of one figure, ſometimes of another, according as the quantity or ſtrength of the Oyl of Vitriol and other Subſtances determin'd. And yet theſe Chriſtals, though ſometimes they would ſhoot into Priſme-like Figures, as Roch'd Petre; and ſometimes into ſhapes more like to Allome or Vitriol; nay though oftentimes the ſame *Caput mortuum* diſſolv'd, would in the ſame Glaſs ſhoot into Chriſtals, whereof ſome would be of one ſhape, ſome of another; yet would theſe differing Grains or Chriſtals appear for the moſt part more exquiſitely figur'd, then oftentimes Vitriol does. From Spirit of Urine and Spirit of Nitre, when I have ſuffer'd them to remain long together before Coagulation, and free'd the mixture from the ſuperfluous moiſture very ſlowly, I have ſometimes obtain'd fine long Chriſtals, (ſome of which I can ſhew you) ſo ſhap'd, that moſt Beholders would take them for Chriſtals of Salt-petre. And I have likewiſe tryed, that whereas Silver is wont to ſhoot into Plates exceeding thin, almoſt like thoſe of *Moſcovia* glaſs, when I have diſſolv'd a pretty quantity of it in *Aqua fortis*, or ſpirit of Nitre, and ſuffer'd it to ſhoot very leiſurely, I have obtain'd Lunar Chriſtals, (ſeveral of which I have yet by me,) whoſe Figure, though ſo pretty as to have given ſome wonder even to an Excellent Geometrician, is differing enough from that of the thin Plates formerly mention'd; each Chriſtal being compoſ'd of many ſmall and finely ſhap'd Solids, that ſtick ſo congruouſly to one another, as to have one ſurface, that appear'd Plain enough, common to them all.

Thirdly, that inſenſible Corpuſcles of different, but all of them exquiſite, ſhapes, and endowed with plain as well as ſmooth ſides, will conſtitute Bodies variouſly, but all very finely figur'd, I have made uſe of ſeveral waies to manifeſt. And firſt, though Harts-horn, Bloud, and Urine, being reſolv'd, and (as the Chymiſts ſpeak) Analiz'd by Diſtillation, may well be ſuppoſ'd to have their ſubſtantial Forms (if they had any) deſtroy'd by the action of the Fire: yet in regard the Saline Particles, they contain, are endow'd with ſuch figures as we have been ſpeaking of, when in the Liquor, that abounds with either of theſe volatile Salts, the diſſolv'd Particles do leiſurely ſhoot into Chriſtals, I have divers times obſerv'd, in theſe, many Maſſes, (ſome bigger, and ſome leſs,) whoſe ſurfaces had Plains, ſome of Figures, as to ſenſe exactly Geometrical, and others very curious and pleaſant. And of theſe finely ſhap'd Chriſtals of various ſizes, I have pretty ſtore by me. And becauſe (as it may be probably gather'd from the Event) the Saline Corpuſcles of Stillatitious acid liquors, and thoſe of many of the Bodies, they are fitted to diſſolve, have ſuch kind of Figures as we have been ſpeaking of, when the ſolutions of theſe Bodies, upon the receſs of the ſuperfluous moiſture, ſhoot into Chriſtals; theſe, though they will ſometimes be differing enough, according to the particular natures of the diſſolv'd Bodies and the Menſtruum, yet either the Chriſtals themſelves, or their Surfaces, or both, will oftentimes have fine and exquiſite Figures; as I have try'd by a Menſtruum, wherewith I was able to diſſolve ſome Gems; as alſo with a ſolution of Coral, made with Spirit of Verdigreeſe, to omit other Examples. And for the ſame reaſon, when I try'd whether the Particles of Silver, diſſolv'd in *Aqua fortis*, would not, without Concoagulating with the Salts, convene, upon the Account of their own ſhapes, into little Concretions of ſmooth and flat ſurfaces, I found, that having (to afford the Metalline Corpuſcles ſcope to move in) diluted one part of the Solution with a great many parts of diſtill'd Rain water, (for common water will oftentimes make ſuch Solutions become white or turbid,) a Plate of Copper being ſuſpended in the Liquor, and ſuffer'd to lie quiet there a while, (for it need not be long) there would ſettle, all about it, ſwarms of little Metalline and Undiaphanous Bodies, ſhining in the water like the ſcales of ſmall Fiſhes, but form'd into little Plates extremely thin, with ſurfaces not onely flat, but exceeding gloſſy: and among thoſe, divers of the larger were prettily figur'd at the Edges. And as for Gold, its Corpuſcles are ſufficiently diſpoſ'd to convene with thoſe of fit or congruous Salts into Concretions of determinate Shapes, as I have found in the Chriſtals I obtain'd from Gold diſſolv'd in *Aqua Regis*, and after having been ſuffer'd to looſe its ſuperfluous moiſture, kept in a cold place:and not onely ſo, but alſo when by a more powerful Menſtruũ I had ſubdivided the Body of Gold into ſuch minute Particles, that they were ſublimable, (for That, I can aſſure you, is poſſible,) theſe volatile Particles of Gold, with the Salts, wherewith they were elevated, afforded me(ſometimes) ſtore of Chriſtals, which, though not all of them near of the ſame Bigneſs, reſembled one another in their ſhape, which was regular enough, and a very pretty one. But of this more elſewhere. §. I remember I have alſo long ſince taken pleaſure to diſſolve two or more of thoſe ſaline Bodies, whoſe ſhapes we know already, in fair Water, that by a very gentle Evaporation I might obtain Concretions, whoſe Shapes ſhould be, though curious, yet differing from the Figure of either of the Ingredients. But we muſt not expect, that, in all caſes, the Salts diſſolv'd together ſhould be *totally* compounded: for oftentimes they are of ſuch different Natures, that one will ſhoot much ſooner then another, and then it frequently happens, that a good Proportion of that will be firſt Chriſtalliz'd in its own ſhape: as is conſpicuouſly to be obſerv'd in the refining of that impure Petre, (which, from the Country that affords it, the Purifiers call *Barbary* Nitre,) from the common Salt it abounds with: and (alſo) as *Agricola* obſerves,* that in ſome caſes, where a Vitriolate Matter is mingled with that, which yields Allom, thoſe two kinds of Salts will ſhoot ſeparately in the ſame large veſſel, (which the Tryals, I have made with the compounded Solutions of thoſe two Salts, do not diſcountenance.) Now in ſuch caſes, all that can be expected, or needs be deſir'd, is, that the remaining part of the mixture, or ſome portion of it, afford Chriſtals, or Grains of compounded ſolid figures.

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* *G. Agricola de re Metallica. lib.* 12.

Though the *Venetian* Borax, wont to be ſold in ſhops, be known to be a factitious Body, compounded of ſeveral Salts, that I ſhall not now ſtay to enumerate; and though, when we buy it, we uſually find it to conſiſt of Lumps and Grains miſhapen enough, yet when I diſſolv'd ſome of it in a good quantity of fair water, and made it coagulate very leiſurely, I had Chryſtals, upon whoſe ſurfaces I could perceive very exquiſite and, as to ſenſe, regular Geometrical figures. And one thing I muſt not here by any means prætermit, which is, that though the *Caput mortuum* of common *Aqua fortis* conſiſts of Bodies of very differing Natures, (for ſuch are Nitre and Vitriol,) and has been expoſ'd to a great violence of the Fire, yet *I* have ſometimes admir'd the curiouſneſs of thoſe figures, that might be obtain'd barely by frequent Solutions and Coagulations of the Saline Particles of this *Caput mortuum* in fair water. But becauſe the Glaſſes, wherein my Concretions were made, were too little to afford great Chriſtals, and they ought to ſhoot very ſlowly; I chooſe rather to ſhew the Curious ſome large Chriſtals, which I took out of the Laboratory of an Ingenious Perſon, who, without minding the Figures, had upon my Recommendation made great quantity of that Salt, in large veſſels, for a Medicine: (it being the *Panacea duplicata*, ſo famous in *Holſtein.*) For *divers* of theſe Chriſtals have not onely Triangles, Hexagons, and Rhomboids, and other Figures exquiſitely Cut on their ſmooth & ſpecular ſurfaces; and *others*, Bodies of Priſmatical ſhapes: But ſome of them are no leſs accurately figur'd then the fineſt Nitre or Vitriol I remember my ſelf to have obſerv'd, and ſome alſo terminate in Bodies almoſt like Pyramids, conſiſting of divers Triangles, that meet in one Vertical point, and are no leſs admirably ſhap'd then the fairer ſort of

Corniſh Diamonds, that have been brought me for Rarities. Beſides, the producing of Salts of new ſhapes, by compounding of Saline Bodies, I have found it to be practicable not onely in ſome Groſs, or, as they ſpeak, Corporal Salts, ſuch as Sea-ſalt, Salt-petre, but alſo in ſome Natural and ſome Chymical Salts diſſolv'd together; and, which perhaps you will think more conſiderable in ſaline Spirits, made by diſtillation: Not that all of them are fit for this purpoſe, but that I have found divers of thoſe, that work upon one another with Ebullition, to be ſo. For in that Conflict the Saline Corpuſcles come to be aſſociated to one another, and thereby, or by their newly acquir'd figure, whilſt their Coalition laſts, to looſe much of their former Volatility: ſo that, upon Evaporation of the ſuperfluous Liquor, they will not fly, as otherwiſe they might; but concoagulate into finely ſhap'd Chriſtals, as I have try'd among other Saline Liquors, with Spirit of Urine, and Spirit of Nitre, and with Oyl of Vitriol, and Spirit of fermented Urine with Spirit of Sheeps bloud, and ſpirit of Salt, and alſo with the Spirits of Salt and of Urine; which Laſt Experiment I the rather mention, becauſe it ſhews, by the difference of the Chriſtals, afforded by thoſe two Liquors, from the Chriſtals reſulting from one of them, namely the ſpirit of Urine, (or if you pleaſe, the Volatile Salt, wherewith it abounds,) concoagulated with a fit Doſe of Oyl of Vitriol, how much thoſe compounded emergent figures depend upon the more ſimple figures of the ſaline Corpuſcles, that happen to convene into thoſe new Concretes. For the ſpirit of Urine, ſatiated with ſpirit of Salt, and both very gently, and not too far, Evaporated, often afforded me Chriſtals, that differ'd exceedingly in ſhape from thoſe, which I obtain'd from the ſame ſpirit of Urine, ſatiated, either with Oyl of Vitriol, or with ſpirit of Nitre. For, (to adde That upon the By,) that Salt, compounded of the two Spirits of Urine and of common Salt, is wont to be very prettily figur'd, conſiſting of one long Beam as it were, whence on both ſides iſſue out far ſhorter Chriſtals, ſometimes perpendicular to that, and parallel to one another like the Teeth in a Combe, and ſometimes ſo inclining, as to make the Whole appear almoſt like a Feather; which is the more remarkable, becauſe I have (many years ago) obſerv'd, that common *Sal* Armoniack, that is made of Urine and common Salt, both crude, with a Proportion of Soot, will, if warily diſſolv'd, and coagulated, ſhoot into Chriſtals of the like ſhape. How far the unknown Figure of a Salt may Poſſibly (for I fear it will not Eaſily) be gheſs'd at, by that of the Figure, which it makes with ſome other Salt, whoſe Figure is already known, I leave to Geometricians to conſider; having, I fear, inſiſted too long on this ſubject already! But yet I muſt adde one particular more, which will, as well illuſtrate and confirme much of what has been ſaid above touching the Origination of Vitriol, as ſhew, that the Shape of Vitriol depends upon the Textures of the Bodies, whereof it is compoſ'd.

Fourthly then, when I conſider'd, that (as I formerly noted) Vitriol being but a Magiſtery, made by the concoagulation of the Corpuſcles of a diſſolv'd Metal, with thoſe of the Menſtruum, the Magiſteries of other Metals might, without inconvenience, be added, as other Vitriolate Concretes to the green, the blew, and white Vitriol, that are without ſcruple referr'd to the ſame *ſpecies*: and when I conſider'd, that Oyl of Vitriol was not a fit Menſtruum to *diſſolve* divers of the Metals, nor even all thoſe, that it will *corrode*; and that the like unfitneſs alſo is to be found in common ſpirit of Salt, I pitch'd upon *Aqua fortis* or ſpirit of Nitre, as that Menſtruum, which was likelieſt to afford variety of Vitriols: and accordingly I found, that beſides the Lovely Vitriol of Copper formerly mention'd, that Liquor would with Quickſilver afford one ſort of Chriſtals, with Silver another, and with Lead a third; all which Chriſtals of Vitriol, as they differ'd from each other in other Qualities, (upon which ſcore you will find this Experiment elſewhere mention'd,) ſo they did very manifeſtly and conſiderably differ in Shape: the Chriſtals of Silver ſhooting in exceeding thin Plates, and thoſe of Lead and Quick-ſilver obtaining figures, though differing enough from each other, yet of a far greater depth and thickneſs, and leſſe remote from the figure of common Vitriol or Sea ſalt: and yet all theſe Vitriols, eſpecially That of crude Lead, when it was happily made, had Shapes curious and elaborate, as well as thoſe, we admire in common Vitriol or Sea-ſalt.

IF then theſe Curious ſhapes, which are believed to be of the admirableſt Effects, and of the ſtrongeſt Proofs of ſubſtantial Forms, may be the Reſults of Texture; and if Art can produce Vitriol its ſelf, as well as Nature, why may we not think, that in ordinary *Phænomena*, that have much leſs of wonder, recourſe is wont to be had to ſubſtantial Forms without any Neceſſity? (Matter, and a Convention of Accidents being able to ſerve the turn without them;) and why ſhould we wilfully exclude thoſe Productions of the Fire, wherein the Chymiſt is but a Servant to Nature, from the number of Natural Bodies? And indeed, ſince there is no certain Diagnoſtick agreed on, whereby to diſcriminate Natural and Factitious Bodies, and conſtitute the *ſpecies* of both; I ſee not, why we may not draw Arguments from the Qualities and Operations of ſeveral of thoſe, that are call'd Factitious, to ſhew how much may be aſcrib'd to, and perform'd by, the Mechanical Characterization or *Stamp* of Matter: Of which we have a noble Inſtance in Gunpowder, wherein by a bare comminution and blending the Ingredients, Nitre, Charcoal, and Brimſtone, which have onely a new, and That an exceeding ſlight Contexture, each retaining its own Nature in the Mixture; ſo that there is no colour afforded to the pretence of a ſubſtantial Form, there is produc'd a new Body, whoſe Operations are more powerful and prodigious, then thoſe of almoſt any Body of Natures own compounding. And though Glaſs be but an Artificial Concrete, yet, beſides that 'tis a very noble and uſeful one, Nature her ſelf has produc'd very few, if enough, to make up a Number more laſting and more unalterable. And indeed divers of thoſe factitious

Bodies that Chymiſtry is able to afford us, are endow'd with more various and more noble Qualities, then many of thoſe, that are unqueſtionably Natural. And if we admit theſe Productions into the number of Natural Bodies, they will afford us a multitude of Inſtances, to ſhew, that Bodies may acquire many and Noble Qualities, barely by having Mechanical Affections, introduc'd by outward Agents into the Matter, or deſtroy'd there. As though Glaſs be ſuch a Noble Body, as we have lately taken notice of, yet ſince tis Fuſibility, Tranſparency, and Brittleneſs, that are its onely Conſtituent Attributes, we can in leſs then an hour, (or, perhaps halfe that time,) turn an Opacous Body into Tranſparent Glaſs, without the Addition of any other Viſible Body, by a change of Texture, made in the ſame Matter, and by another change of Texture, made without Addition, as formerly, we can, in a trice, reduce Glaſs into, or obtain from it a Body, not Glaſſy, but Opacous, and otherwiſe of a very differing Nature, as it had been before. And here let me adde what may not a little conduce to our preſent Deſign, That even thoſe, that imbrace *Ariſtotle's* principles, do unawares confeſſe, that a ſlight change of Texture, without the introduction of a ſubſtantial Form, may not onely make a Specifical difference betwixt Bodies, but ſo vaſt a one, that they ſhall have differing *Genus'es*, and may (as the Chymiſts ſpeak) belong to differing Kingdoms. For Coral, to paſs by all other Plants of that kind, that may be mention'd to the ſame purpoſe, whilſt it grows in the Bottom of the Sea, is a real Plant, and ſeveral times (which ſuffices for my preſent ſcope) hath been there found by an Acquaintance of mine, as well as by other Inquirers, ſoft and tender like another Plant. Nay, I elſewhere* bring very good and recent Authority to prove, that it is oftentimes found very ſucculent, and does propagate its *ſpecies*, as well as other Shrubs; and yet Coral, being gather'd and remov'd into the Air, by the receſs of its Soul, no new Lapidifick Form being ſo much as pretended to, turns into a Concretion, that is, by many Eminent Writers and others, reckon'd among Lapideous ones: as indeed Coral does not burn like Wood, nor obey Diſtillation like it; and not onely its *Calx* is very differing from the Aſhes of Vegetables, and is totally ſoluble in divers acid Liquors, and even Spirit of Vinegar, but the uncalcin'd Coral its ſelf will be eaſily corroded by good Vinegar, after the ſame manner as I have ſeen *Lapis ſtellaris*, and other unqueſtionably Mineral ſtones diſſolv'd, ſome by that Liquor, and ſome by the Spirit of it. A much ſtranger thing may be ſeen in the Eaſt-India Iſland of *Sombrero*, not very far from

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* In the Eſſays about things ſuppoſed to be ſpontaneouſly generated.

Sumatra, if we may believe our Countryman S^r^ *James Lanceſter*, who relates it as an Eye witneſſe, for which reaſon, and for the ſtrangeneſs of the thing, I ſhall adde the ſtory in his own words. *Here* (*ſayes he, ſpeaking of the Coaſt of *Sombrero*) *we found upon the ſand by the Sea ſide, a ſmall Twigge growing up to a young Tree, and offering to pluck up the ſame, it ſhrunk down into the ground, & ſinketh, unleſs you hold very hard. And being pluck'd up, a great Worme is the Root of it: and look how the Tree groweth in greatnes, the VVorme diminiſheth Now as ſoon as the VVorm is wholly turn'd into the Tree, it rooteth in the ground, and ſo groweth to be great. This Tranſformation was one of the greateſt wonders I ſaw in all my Travels. This Tree being plucked up a little, the Leaves ſtripped off and the Pill, by that time it was dry turned into a hard Stone, much like to white Coral. So that* (concludes he)

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* *Purchaſ. Pilgr. part. the firſt. p.*152.

this worme was twice tranſformed into different natures: of theſe we gather'd and brought home many. The Induſtrious *Piſo*, in his Excellent Hiſtory of *Braſil*, vouches a multitude of Witneſſes (not having Opportunity to be one himſelf) for the ordinary Transformation of a ſort of Animals (not much unlike Graſs-hoppers) into Vegetables, at a certain ſeaſon of the * year.

But ſince I ſate down this Relation of Sr *John Lanceſter*, I have met with another, whoſe ſtrangeneſs may much countenance it, in a ſmall Tract newly publiſh'd by a Jeſuite, *F. Michael Boym*, whom a good Critick much commended to me. For this Author doth, as an Eyewitneſſe, affirme that, which is little leſſe to my preſent Purpoſe. * *Ie vis*, i.e. *I ſaw in a ſmall freſh water, and ſhallow Lake of the Iſland* Hainan, (which belongs to *China) Crabs, or Crawfiſhes, which, as ſoon as they were drawn out of the water, did in a moment looſe both Life and Motion, and became petrify'd, though nothing appear'd to be chang'd either in the External or Internal figure of their Bodies.* What he further addes of theſe Fiſhes, is but of their Virtues in Phyſick, which, not concerning our ſubject, I ſhall (*Pyrophilus*) willingly prætermit it; and even, as to our Country-man's relation, hoping, by means of an Ingenious Correſpondent in the Eaſt-Indies, to receive a further Information about the ſtrange Plant he mentions, I ſhall, at preſent, urge onely what has been taken notice of concerning Coral, to countenance the Obſervation, for whoſe ſake theſe Narratives have been alleadg'd. And ſo likewiſe, as to what I was ſaying of Glaſs, and Gunpowder, our receiving of thoſe and the generality of Factitious Bodies into the Catalogue of Natural Bodies, is not (which I formerly alſo intimated) neceſſary to my preſent Argument: whereto it is ſufficient, that Vitriol is granted on all hands to be a Natural Body, though it be alſo producible by Art. And alſo to the Argument it affords us, we might adde that memorable Experiment deliver'd by *Helmont*, of turning Oyl of Vitriol into Allom, by the Odour (as he calls it) of Mercury, if, however it be not deſpicable, we had found it fit to be rely'd on. But reſerving an Account of that for another place, we ſhall ſubſtitute the Inſtance, preſented us by our Author, about the Production of Salt-petre: for if, having diſſolv'd Pot-aſhes in fair water, you coagulate the filtrated Solution into a white Salt, and on that pour Spirit of Nitre, till they will not hiſs any longer together, there will ſhoot, when the ſuperfluous water is Evaporated, Chriſtals, that proclaim their Nitrous Nature by their Priſmatical, (or at leaſt Priſme-like) Shape, their eaſie Fuſion, their Accenſion, and Deflagration, and other Qualities, *partly* mention'd by our Author, and *partly* diſcoverable by a little Curioſity in making Tryals.

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* The paſſage, which is long, I do not here tranſcribe, having had occaſion to do it elſewhere. It is extant *Lib. 5. Cap. 21.* and at the cloſe of his Narrative he ſubjoynes, *Non eſt, quod quiſquam de veritate dubitet, cum infinitos teſtes habeat Braſilia, &c.*

* *Flora Sinenſis ou Traite des Fleurs &c.* under the title *Lozmeoques.*

II.

Experimental Attempts about the Redintegration *of Bodies.*

THe former of thoſe two Arguments, (*Pyrophilus*) by which I propoſ'd to confirme the Origine of Forms, was, as you may remember, grounded upon the Manner, by which ſuch a Convention of Accidents, as deſerves to paſſe for a Form, may be produc'd: and That having been hitherto proſecuted, it now remains, that we proceed to the Second Argument, drawn, not (as the former) from the firſt Production, but from the Reproduction of a Phyſical Body. And though both theſe Arguments are valid; yet if this Latter could, in ſpight of the Difficulties intervening in making of the Experiments that belong to it, be as clearly made out as the former, you would, I ſuppoſe, like it much the better of the two. For if we could Reproduce a Body, which has been depriv'd of its ſubſtantial Form, you would, I preſume, think it highly probable, if not more then probable, that (to borrow our Author's Expreſſion) That which is commonly call'd the Form of a Concrete, which gives it its Being and Denomination, and from whence all its Qualities are in the Vulgar Philoſophy, by I know not what inexplicable waies, ſuppos'd to flow; may be in ſome Bodies but a Characterization or Modification

cation of the Matter they conſiſt of; whoſe parts, by being ſo and ſo diſpoſ'd in relation to each other, conſtitute ſuch a determinate kind of Body, endow'd with ſuch and ſuch Properties; whereas, if the ſame parts were otherwiſe diſpoſ'd, they wonld conſtitute other Bodies, of very differing Natures from that of the Concrete, whoſe parts they formerly were, and which may again reſult or be produc'd, after its diſſipation, and ſeeming deſtruction, by the Re-union of the ſame component Particles, aſſociated according to their former Diſpoſition.

But though it were not Impoſſible to make an adæquate Redintegration of a Chymically Analiz'd Body, becauſe ſome of the diſſipated parts will either eſcape through the Junctures of the Veſſels, (though diligently cloſ'd,) or, if they be very ſubtle, will fly away upon the diſjoyning of the Veſſels; or, will irrecoverably ſtick to the inſide of them: yet I ſee not, why ſuch a Reproduction, as is very poſſible to be effected, may not ſuffice to manifeſt what we intend to make out by it. For, even in ſuch Experiments, it appears, that when the Form of a Natural Body is aboliſh'd, and its parts violently ſcatter'd; by the bare Reunion of ſome parts after the former manner, the very ſame Matter, the deſtroy'd Body was before made of, may, without Addition of other Bodies, be brought again to conſtitute a Body of the *like Nature* with the former, though not of *equal Bulk*. And indeed, the Experiment, recorded by our Author, about the Reproduction of Salt Petre, as it is the beſt and ſucceſſesfulleſt I have ever been able to make upon Bodies, that reqnire a ſtrong Heat to diſſipate them; ſo I hope it will ſuffice to give you thoſe thoughts about this matter, that the Author deſign'd in alledging it; and therefore, though having premiſ'd thus much, I ſhall proceed to acquaint you with the ſucceſs of ſome Attempts he intimates (in that Eſſay) his Intention of making, for the Redintegration of ſome Bodies; yet doing it onely out of ſome Hiſtorical Notes I find among my looſe Papers; That, which I at preſent pretend to, is, but *partly* to ſhew you the *difficulty* of ſuch Attempts, which, ſince our Author's Eſſay was communicated, have been repreſented (I fear by Conjecture onely) as *very eaſie* to be accurately enough done; and *partly*, becauſe our Author does not, without reaſon, intimate the uſefulneſs of Redintegrations, in caſe they can be effected; and does, not cauſeleſly, intimate, that ſuch Attempts, though they ſhould not Perfectly ſucceed, may increaſe the Number of Noble and Active Bodies, and conſequently, the Inventory of Mankind's Goods.

Upon ſuch Conſiderations we attempted the Diſſipation and Reunion of the parts of common Amber; and though

Chymiſts, for fear of breaking their Veſſels, are wont, when they commit it to diſtillation, to adde to it a *caput mortuum* (as they ſpeak) of Sand, Brick, &c. (in whoſe room we ſometimes chooſe to ſubſtitute beaten Glaſs;) which hinders them to judge of and employ the Remanence of the Amber, after the Diſtillation is finiſh'd: yet we ſuppoſ'd, and found, that if the Retort were not too much fill'd, and if the Fire were ſlowly and warily enough adminiſter'd, the Addition of any other Body would be needleſs. Wherefore having put into a Glaſs Retort four or five Ounces of Amber, and adminiſtred a gentle and gradual heat, we obſerv'd the Amber to melt and bubble, (which we therefore mention, becauſe ingenious men have lately queſtioned, whether it can be melted,) and having ended the Operation, & ſever'd the veſſels, we found, that there was come over in the form, partly of Oyl, partly of Spirit & Flegm, and partly of volatile Salt, near half the weight of the Concrete: and having broken the Retort, we found, in the bottom of it, a Cake of coal-black Matter, then whoſe upper ſurface I ſcarce remember to have ſeen in my whole life any thing more exquiſitely poliſh'd; in ſo much, that, notwithſtanding the Colour, as long as I kept it, it was fit to ſerve for a Looking Glaſs: and this ſmooth Maſs being broken, (for it was exceeding brittle,) the larger fragments of it appear'd adorn'd with an excellent luſtre. All thoſe parts of the Amber, being put together into a Glaſs Body, with a blind head luted to it, were placed in Sand, to be incorporated by a gentle heat: but whilſt I ſtept aſide to receive a Viſit, the Fire having been increaſ'd without my knowledge, the Fumes aſcended ſo copiouſly, that they lifted up the Veſſel out of the Sand, whereupon falling againſt the ſide of the Furnace, it broke at the top, but, being ſeaſonably call'd, we ſav'd all but the Fumes; and the remaining Matter looks not unlike Tarre, and with the leaſt heat may be powr'd out like a Liquor, ſticking even when it is cold to the fingers. Yet this open'd Body doth not eaſily communicate ſo much as a Tincture to ſpirit of Wine, (which therefore ſeems ſomewhat ſtrange, becauſe another time preſumeing, that this would be a good way to obtain a Solution of ſome of the reſinous parts of Amber, we did, by pouring ſpirit of Wine, that (though rectify'd) was not of the very beſt, upon the reunited parts of Amber, lightly digeſted into a Maſs, eaſily obtain a clear Yellow Solution, very differing from the Tincture of Amber, and abounding (as I found by Tryal) in the diſſolv'd ſubſtance of the Amber:) but in Oyl of Turpentine we have, in a ſhort time, diſſolv'd it into a bloud red Balſome, which may be of good uſe (at leaſt) to Chirurgions. And having agen made the former Experiment with more warineſs then before, we had the like ſucceſs in our Diſtillation, but, the reunited parts of the Amber being ſet to digeſt in a large Bolt head, the Liquor that was drawn off, did, in a few hours, from its own *Caput mortuum* extract a bloud red Tincture, or elſe made a Solution of ſome part of it, whereby it obtain'd a very deep Red; but having been, by intervening Accidents, hindred from finiſhing the Experiment, we miſt the Satisfaction of knowing to what it may be brought at laſt.

And as for what our Author tels us of this deſign to attempt the Redintegration of Vitriol, Turpentine, and ſome other Concretes, wherein it ſeem'd not unpracticable, he found in it more difficulty then every one would expect. For the Bodies, on which ſuch Experiments are likelieſt to ſucceed, ſeem to be Allom, Sea ſalt, and Vitriol. And as for Allom, he found it a troubleſome work to take (as a Spagiriſt would ſpeak) the Principles of it aſunder, in regard, that it is inconvenient to diſtill it with a *Caput mortuum*, (as Chymiſts call any fix'd Additament,) leaſt that ſhould hinder the deſir'd Redintegration of the diſſipated parts: And when he diſtill'd it by its ſelf, without any ſuch Additament, he found, that, with a moderate heat, the Allom would ſcarce part with any thing but its Phlegm, and if he urg'd it with a ſtrong fire, he found, it would ſo ſwell, as to endanger the breaking of the Retort, or threaten the boyling over into the Receiver. (Yet having once been able very warily to abſtract as much Flegm and Spirit, as I conveniently could, from a parcel of Roch Allom, and having powr'd it back upon that pulveriz'd *caput mortuum*, and left the veſſel long in a quiet place, I found, that the Corpuſcles of the Liquor, having had time, after a multitude of Occurſions, to accommodate and re-unite themſelves to the more fix'd parts of the Concrete, did by that Aſſociation (or Diſſolution) recompoſe, at the top of the Powder, many Chriſtalline Grains of finely figur'd Salt, which increaſing with time, made me hope, that, at the length, the whole or the greateſt part would be reduc'd into Allom, which yet a Miſchance, that robb'd me of the Glaſs, hindred me to ſee.) So likewiſe of Sea ſalt, if it be diſtill'd, as it is uſual, with thrice its weight of burn'd Clay, or beaten Brick, twill prove inconvenient in reference to its Redintegration; and if it be diſtill'd alone, it is apt to be fluxt by the heat of the fire, and, whilſt it remains in Fuſion, will ſcarce yield any Spirit at all. And as for Vitriol, though the Redintegration of it might ſeem to be leſs hopeful, then that of the other Salts, in regard that it conſiſts not onely of a Saline, but of a Metalline Body, whence it may be ſuppos'd to be of a more intricate and elaborate Texture:

yet becauſe there needs no *caput mortunm* in the Diſtillation of it, we did, to purſue our Author's intimated deſigns, make two or three Attempts upon it, and ſeem'd to miſs of our Aime, rather upon the Account of accidental hinderances, then of any inſuperable difficulty in the thing it ſelf. For once, we with a ſtrong fire, drew off from a parcel of common blew Vitriol, the Phlegm and Spirit, and ſome quantity of the heavy Oyl, (as Chymiſts abuſively call it:) Theſe Liquors, as they came over without Separation, we divided into ſeveral parts, and the remaining very red *Caput mortuum* into as many. One of theſe parcels of Liquor we poured over night upon its correſpondent portion of the newly mentioned red Powder. But having left it in a Window, and the Night proving very bitter, in the morning I found the Glaſs crack'd in many places by the violence of the Froſt, and the Liquor ſeem'd to have been ſoak'd up by the Powder, and to have very much ſwelled it. This mixture then I took out, and placing it in an open mouth'd Glaſs in a Window, I found, after a while, divers Grains of pure Vitriol upon the other Matter, and ſome little Swellings, not unlike thoſe we ſhall preſently have Occaſion to ſpeak of. I took likewiſe a much larger parcel of the forementioned Liquor, and its correſpondent proportion of *Caput mortuum*; and having leiſurely mixt them in a large Glaſs Baſon, I obtain'd divers *Phænomena*, that belong not to this place, but may be met with, where they will more properly fall in. In this Baſon (which I lay'd in the Window, and kept from Agitation,) I perceived, after a while, the Liquor to acquire a blewiſh Tincture, and after ten or twelve weeks, I found the mixture dry, (for, it ſeems, it was too much expoſed to the Air:) but the Surface of it adorn'd in divers places with Grains of Vitriol very curiouſly figur'd. And beſides theſe, there were ſtore of Protuberances, which conſiſted of aboundance of ſmall vitriolate particles, which ſeem'd in the way to a Coalition; for having let the Baſon alone for four or five months longer, the Matter appear'd cruſted over, partly with very elevated Saline protuberances, partly with leſſer parcels, and partly alſo with conſiderably broad Cakes of Vitriol, ſome of above half an Inch in breadth, and proportionably long; and indeed the whole ſurface was ſo odly diverſifi'd, that I cannot count the trouble, theſe Tryals have put me to, miſpent. Another time in a more ſlender and narrow mouth'd Glaſs I pour'd back upon the *Caput mortuum* of Vitriol the Liquors, I had by violence of the fire forc'd from it; ſo that the Liquid part did ſwim a pretty height above the red *Calx*, and remain'd a while limpid and colourleſs: but the veſſel having ſtood, for ſome time, unſtop'd in a Window, the Liquor after a while, acquir'd by degrees a very deep vitriolate colour, and not long after, there appear'd, at the bottom and on the top of the *Calx*, many fair and exquiſitely figur'd Grains of Vitriol, which cover'd the ſurface of the *Calx*; and the longer the veſſel continu'd in the Window, the deeper did this Change, made upon the upper part of the Powder, ſeem to penetrate: ſo that I began to hope, that, in proceſs of time, almoſt (if not more then almoſt) the whole mixture would be reduc'd to perfect Vitriol. But an Accident robb'd me of my Glaſs, before I could ſee the utmoſt of the Event.

And, on this Occaſion, I muſt not prætermit an odd Experiment I lately made, though I dare not undertake to make it agen. I elſewhere relate, how I digeſted, for divers weeks, a Quantity of powder'd Antimony, with a greater weight by half of Oyl of Vitriol, and how having at length committed this mixture to Diſtillation,and thereby obtained, beſides a little Liquor, a pretty quantity of combuſtible Antimonial or Antimonio-Vitriolate Sulphur; there remained,in the bottom of the Retort,a ſomewhat light and very friable *Caput mortuum*, all the upper part of which was at leaſt as white as common Woodaſhes, and the reſt look'd like a Cinder. And now I muſt tell you what became of this *Caput mortuum*, whereof I there make no further mention. We could not well foreſee what could be made of it, but very probable it was, that it would afford us ſome new Diſcovery, by being expoſed to the fire, in regard of the copious Sulphur, whereof it ſeem'd to have been deprived: provided it were urg'd in cloſe Veſſels, where nothing could be loſt. Whereupon committing it to a naked fire in a ſmall glaſs Retort, well Coated, and accommodated with a Receiver, we kept it there many hours, and at length ſevering the

Veſſels, we found (which need not be wonder'd at) no Antimonial Quick-ſilver, and much leſs of Sulphur ſublim'd then we expected: wherefore greedily haſtning to the *Caput mortuum*, we found it flux'd into a Maſs, covered with a thin Cake of Glaſs, whoſe fragments being held againſt the light, were not at all coloured, as Antimonial Glaſs is wont to be, but were as colourleſſe as common white Glaſs. The Lump above mentioned being broken, was found, ſomewhat to our wonder, to be perfect black Antimony, adorn'd with long ſhining ſtreaks, as common Antimony is wont to be: onely this Antimony ſeem'd to have been a little refin'd by the ſequeſtration of its unneceſſary Sulphur; which Ingredient ſeems by this Experiment, as well as by ſome other Obſervations of ours, to be more copious in ſome particular Parcels of that Mineral, then is abſolutely requiſite to the conſtitution of Antimony. Though in our caſe it *may* be ſuſpected, that the reduction of part of the Maſs to a colourleſs Glaſs, was an effect of the Abſence of ſo much of the Sulphur, and might *in part* make the remaining Maſſe ſome amends for it. What we further did with this new or reproduced Concrete, is not proper to be here told you: onely, for your ſatisfaction, we have kept a Lump of it, that you may, with us, take notice of what ſome Philoſophers would call the Mindfulneſs of Nature, which, when a Body was deprived of a not inconſiderable portion of its chiefe Ingredient, and had all its other parts diſſipated, and ſhuffled, and diſcolour'd, ſo as not to be knowable, was able to rally thoſe ſcatter'd and diſguiſed parts, and Marſhal or diſpoſe them into a Body of the former Conſiſtence, Colour, &c. though (which is not here to be overlook'd) the Contexture of Antimony, by reaſon of the copious ſhining *Styriæ*, that enoble the darker Body, be much more elaborate, and therefore more uneaſie to be reſtored, then that of many other Concretes.

But among all my Tryals about the Redintegration of Bodies, That which ſeem'd to ſucceed beſt, was made upon Turpentine: for having taken ſome Ounces of this, very pure, and good, and put it into a Glaſs Retort, I diſtill'd ſo long with a very gentle fire, till I had ſeparated it into a good quantity of very clear Liquor, and a *Caput mortuum* very dry and brittle: then breaking the Retort, I powder'd the *Caput mortuum*, which, when it was taken out, was exceeding ſleek, and tranſparent enough, and very Red; but being powder'd, appear'd of a pure Yellow colour. This Powder I carefully mixt vvith the Liquor, that had been diſtill'd from it, vvhich immediately diſſolv'd part of it into a deep red Balſam; but by further Digeſtion in a large Glaſs exquiſitely ſtopt, that Colour began to grovv fainter,

ter, though the remaining part of the Povvder, (except a very little proportionable to ſo much of the Liquor, as may be ſuppoſ'd to have been vvaſted by Evaporation, and Transfuſion out of one Veſſel into another,) be perfectly diſſolv'd, and ſo well reunited to the more fugitive parts of the Concrete, that there is ſcarce any, that by the ſmell, or taſt, or conſiſtence, vvould take it for other then good and laudable Turpentine.

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The I. Section *of the Hiſtorical Part* (*containing the* Obſervations, *and beginning at pag.* 107.) *is miſplac'd, and ought to have come in here, and have immediately preceded this* II. Section *containing the* Experiments.

ADVERTISEMENTS *about the enſuing* *II. SECTION.*

THE Author would not have the Reader think, that the following Experiments, are the ſole ones that he could have ſet down to the ſame purpoſe with them. For they are not the onely that he had actually laid aſide for this occaſion, till judging the enſuing ones ſufficient for his preſent ſcope, he thought it fitter to reſerve Others for thoſe Notes *about the Production of particular Qualities, to which they ſeem'd properly to belong. Perhaps alſo it will be requiſite for me (becauſe ſome Readers may think the Omiſſion a little ſtrange) to excuſe my having left divers particulars unmentioned in more then One of the enſuing Experiments. And I confeſſe that I might eaſily enough both have taken notice of more Circumſtances in them, and made far more Reflections on them, if I would have expatiated on the ſeveral Experiments according to the Directions deliver'd in other* Papers. But though* there, *where twas my Deſign to give imployment to the Curioſity and Diligence of as many Votaries to Nature, as (for want of better inſtructions) had a mind to be* ſo *ſet on work, it was fit the propoſed Method ſhould be ſuitable;* yet here, *where I deliver Experiments, not ſo much as parts of Natural Hiſtory, as inſtances to confirm the* Hypotheſes, *and Diſcourſes they are annexed to; it ſeemed needleſſe, and improper, (if not impertinent,) to ſet down Circumſtances, Cautions, Inferences, Hints, Applications, and other Particulars, that had no tendency to the ſcope, for which the Experiments were alledged.*

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* Containing ſome Advices and Directions for the writing of an Experimental Natural Hiſtory.

☞ *Theſe two Leaves are to be placed immediately before the* 271 *page.*

And as for the kind of Experiments, here made choice of, I *have the leſs ſcrupled to pitch upon Chymical Experiments, rather then Others on this occaſion; not onely becauſe of thoſe Advantages which I have aſcrib'd to ſuch Experiments in the latter part of the Preface* * *to my* Specimens, *but becauſe I have been Encouraged by the ſucceſs of the Attempt made in thoſe Diſcourſes. For as new as it was when I made it four or five years ago, and as unuſual a Thing as it could ſeem to divers Atomiſts and Carteſians, That I ſhould take upon me to Confirm and Illuſtrate the Notions of the Particularian Philoſophy (if I may ſo call it) by the help of an Art, which many were pleaſ'd to think cultivated but by Illiterate Operators, or Whymſical Phanaticks in Philoſophy, and uſeful onely to make Medicines, or Diſguize Metals: yet theſe Endeavours of ours met with much leſſe oppoſition, then new Attempts are moſt commonly fain to ſtruggle with. And in ſo ſhort a time I have had the happineſs to engage both divers Chymiſts to learn and reliſh the Notions of the Corpuſcular Philoſophy, and divers eminent* Embracers *of That, to endeavour to illuſtrate and promote the New Philoſophy, by addicting themſelves to the Experiments, and peruſing the Books of Chymiſts. And I acknowledge, it is not unwelcome to me to have been (in ſome little meaſure) inſtrumental to make the* Corpuſcularian Philoſophy, aſſiſted by Chymiſtry, *preferred to that which has ſo long obtained in the* Schools. *For (not here to conſider, which I elſewhere do, how great an Advantage That Philoſophy hath of This, by having an advantage of it in point of clearneſs,) though divers Learned and worthy men, that knew no better Principles, have, in cultivating the Peripatetick Ones, abundantly exerciſed and diſplaid their own Wit:*yet I *fear they have very little,* if at all, improved their Readers Intellect, or enricht it with any true or uſeful Knowledg of Nature; but have rather taught him to Admire Their Subtlety, then Underſtand Hers. For to aſcribe all particular Phænomena, that ſeem any thing Difficult, (for abundance are not thought ſo, that are ſo,) to ſubſtantial Forms, and, but nominally underſtood, Qualities, is ſo general and eaſie a way of reſolving Difficulties, that it allows Naturaliſts, without Diſparagement, to be very Careleſs and Lazy, if it do not make them ſo: as in effect we may ſee, that in about 2000 years ſince Ariſtotles time, the Adorers of his Phyſicks, at leaſt by vertue of His peculiar Principles, ſeem to have done little more more then Wrangle, without clearing up (that I know of) any myſtery of Nature, or producing any uſeful or noble Experiments: whereas the Cultivators of the Particularian Philoſophy, being obliged by the nature of their Hypotheſis, and their way of Reaſoning, to give the particular Accounts aud Explications of particular Phænomena of Nature, are alſo obliged, not onely to know the general Laws and Courſe of Nature, but to enquire into the particular Structure of the Bodies they are converſant with, as that wherein, for the moſt part, their Power of acting, aud Diſpoſition to be acted on, does depend. And in order to this, ſuch Enquiries muſt take notice of Abundance of Minute Circumſtances; and to avoid miſtaking the Cauſes of ſome of them, muſt often Make and Vary Experiments; by which means Nature comes to be much more diligently and induſtriouſly Studied, and innumerable Particulars are diſcover'd and obſerved, which in the Lazy Ariſtotelian way of Philoſophizing would not be Heeded. But to return to that Decad of Inſtances, to which theſe Advertiſements are premiſed; I hope I need not make an Apology for making choice rather of Chymical Experiments, then others, in the ſecond and concluding

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* The Preface, here mentioned, is that premiſed to the Tract intituled——*Some Specimens of an Attempt to make Chymical Experiments uſeful to illuſtrate the Notions of the Corpuſcular Philoſophy.*

Section of the Hiſtorical Part of the preſent Treatiſe. But though I prefer that Kind *of Inſtances, yet I would not be thought to overvalue* Them *in their kind, or to deny, that ſome Artiſts may (for ought I know) be found, to whoſe Chymical* Arcana,*theſe Experiments may be little better then Trifles. Nor perhaps are theſe the conſiderableſt, that I my ſelf could eaſily have communicated; (though theſe themſelves would not be now Divulged, if I would have been ruled by the Diſſwaſions of ſuch as would have nothing of Chymical made Common, which they think Conſiderable.) But things of greater Value in themſelves, and of Noble Uſe in Phyſick, may be leſs Fit for our preſent purpoſe, (which is not to impart Medicinal, or Alchymiſtical Proceſſes, but illuſtrate Philoſophical Notions,) then ſuch Experiments as theſe; which, beſides that they containe Variety of* Phænomena, *do not (for the moſt part) require either much Time, or much Charge, or much Skill.*

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The II. Sect.

The II. SECTION, containing the EXPERIMENTS.

Experiment I.

TAke good and clear Oyl of Vitriol, and caſt into it a convenient quantity of good Camphire groſly beaten; let it float there a while, and, without the help of external heat, it will inſenſibly be reſolv'd into a Liquor, which, from time to time, as it comes to be produc'd, you may, by ſhaking the Glaſs, mingle with the Oyl of Vitriol, whereunto you may, by this means, impart firſt a fine Yellow, and then a colour, which though it be not a true Red, will be of kin to it, and ſo very deep, as to make the mixture almoſt quite Opacous. When all the Camphire is perfectly diſſolv'd by incorporating with the Menſtruum, if you hit upon good Ingredients, and upon a right Proportion, (for a ſlight Miſtake in either of them, may make this part of the Experiment miſcarry,) you may probably obtain ſuch a mixture, as I have more then once had, namely, ſuch a one, as not onely to me, whoſe ſenſe of Smelling is none of the Dulleſt, but alſo to others, that knew not of the Experiment, ſeem'd not at all to have an Odour of the Camphire. But if into this Liqnor you pour a due quantity of fair Water, you will ſee (perhaps not without delight) that, in a trice, the Liquor will become pale, almoſt as at the firſt, and the Camphire, that lay conceal'd in the pores of the Menſtruum, will immediately diſcloſe it ſelf, and emerge, in its own nature and priſtine form of white floating and combuſtible Camphire, which will fill not the Viol onely, but the neighbouring part of the Air with its ſtrong and Diffuſive Odour.

Now the *Phænomena* of this Experiment may, beſides the uſes we elſewhere make of it, afford us ſeveral particulars pertinent to our preſent purpoſe.

I. For (firſt) we ſee a lighter and conſiſtent Body brought, by a Comminution, into Particles of a certain figure, to be kept ſwimming, and mixed with a Liquor, on which it floated before, and which is, by great odds, heavier then it ſelf: ſo that as by the Solution of Gold in *Aqua regis*, it appears, that the ponderouſeſt of Bodies, if it be reduc'd to parts minute enough, may be kept from ſinking in a Liquor much lighter then it ſelf: So this Experiment of Ours manifeſts what I know not whether hitherto Men have prov'd, That the Corpuſcles of Lighter Bodies may be kept from emerging to the Top of a much heavier Liquor: which Inſtance being added to that of the Gold, may teach us, that,

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when Bodies are reduc'd to very minute parts, we muſt as well conſider their particular Texture, as the receiv'd Rules of the Hydroſtaticks, in determining whether they will ſink, or float. or ſwim.

II. This Experiment alſo ſhews, that ſeveral Colours, and even a very deep one, may ſoon be produc'd by a White Body, and a clear Liquor, and that without the intervention of fire, or any external heat.

III. And that yet this Colour may, almoſt in the twinckling of an Eye, be deſtroy'd, and as it were annihilated, and the Latitant Whiteneſs, as many would call it, may be as ſuddainly reſtor'd by the Addition of nothing but fair Water, vvhich has no Colour of its ovvn, upon vvhoſe account it might be ſurmiſ'd to be contrary to the periſhing colour, or to heighten the other into a Prædominancy: nor does the Water take into its ſelf, either the Colour it deſtroy'd, or That it reſtores. For

IV. The more then ſemi-opacity of the Solution of Camphire and Oyl of Vitriol does preſently vaniſh; and that Menſtruum, with the Water, make up (as ſoon as the Camphorate Corpuſcles come to be a float) one tranſparent and colourleſs Liquor.

V. And tis worth noting, that upon the mixture of a Liquor, which makes the Fluid much Lighter, (for ſo Water is in reſpect of Vitriol,) a Body is made to emerge, that did not ſo, when the Fluid was much heavier. This Experiment may ſerve to countenance what we elſewhere argue againſt the Schools, touching the Controverſie about Miſtion. For whereas though ſome of them diſſent, yet moſt of them maintain, that the Elements alwaies looſe their Forms in the mix'd Bodies they conſtitute; and though if they had dexterouſly propoſ'd their Opinion, and limited their Aſſertions to ſome caſes, perhaps the Doctrine might be tolerated: yet ſince they are wont to propoſe it crudely and univerſally, I cannot but take notice, how little tis favour'd by this Experiment; wherein even a mix'd Body (for ſuch is Camphire) doth, in a further miſtion, retain its Form and Nature, and may be immediately ſo divorced from the Body, to which it was united, as to turn, in a trice, to the manifeſt Exerciſe of its former Qualities. And this Experiment being the eaſieſt Inſtance, I have deviſ'd, of the preſervation of a Body, when it ſeems to be deſtroy'd, and of the Recovery of a Body to its former Conditions; I deſire it may be taken notice of, as an inſtance I ſhall after have Occaſion to have recourſe to, and make uſe of.

VI. But the notableſt thing in the Experiment is, that Odours ſhould depend ſo much upon Texture, that one of the ſubtleſt and ſtrongeſt ſented Drugs, that the Eaſt it ſelf or indeed the World affords us, ſhould ſo ſoon quite looſe its Odour, by being mix'd with a Body that has ſcarce, if at all, any ſenſible Odour of its own, and This, while the Camphorate Corpuſcles ſurvive undeſtroy'd, in a Liquor, from whence one would think, that leſſe ſubtle and fugitive Bodies, then they, ſhould eaſily exhale.

VII. Nor is it much leſſe conſiderable, that ſo ſtrong and piercing a Sent as that of Camphire, ſhould be, in a moment, produc'd in a Mixture, wherein none of it could be perceiv'd before, by ſuch a Liquor as Water, that is quite devoid of any Odour of its own: which ſo eaſie and ſuddain reſtauration of the Camphire to its Native Sent, as well as other Qualities, by ſo languid a Liquor as common Water, doth likewiſe argue, that the Union or Texture of the two Ingredients, the Camphire and the Oyl of Vitriol, was but very ſlight, upon which neverthleſſe a great alteration in point of Qualities depended. And to confirme

firme, that divers of the præceding *Phænomena* depend upon the particular Texture of the Liquors, imploy'd to exhibit them, I ſhall add, that if, inſtead of oyl of Vitriol, you caſt the Concrete into well deflegm'd Spirit of Nitre, you will obtain no red, nor dark, but a Tranſparent and Colourleſs Solution. And when to the above mention'd red Mixture I put, inſtead of fair Water, about 2 or 3 parts of duely rectifi'd Spirit of Wine, there would enſue no ſuch changes, as thoſe formerly recited; but the Spirit of Wine, that diſſolv'd the Concrete, when it was by it ſelf, without looſing its Diaphaneity, or acquiring any Colour, did, when it diſſolv'd the Mixture, diſſolve it with its new adventitious Colour, looking like a groſs red Wine, ſomewhat turbid, or not yet well freed from its Lees: ſo that this Colour appear'd to reſide in the Mixture as ſuch, ſince neither of the two Ingredients diſſolv'd in, or mingled vvith the

Spirit of Wine, would have afforded that Colour, or indeed any other. But if to this Liquor, that look'd like troubled Wine, we poured a large Proportion of fair Water, the Redneſs would immediately vaniſh, and the Whole would, *as to ſenſe*, become White throughout; I ſay, *as to ſenſe*, becauſe the Whiteneſſe did not indeed appertain properly to the whole Mixture, but to a huge multitude of little Corpuſcles of the reviv'd Concrete, whereof ſome or other, which at firſt ſwamme confuſedly to and fro, left no ſenſible Portion of the Liquor unfurniſh'd with ſome of them; whereas when the Camphorate Corpuſcles had leiſure to emerge, as they ſoon did, they floated in the forme of a White Powder or Froth at the top of the Liquor, leaving all the reſt as clear and colourleſſe as the common Water.

But we have not yet mention'd all the uſe, we deſign'd to make of our

Mixture, for by proſecuting the Experiment a little further, we made it afford us ſome new *Phænomena.*

VIII. For having kept the Mixture in a moderately warme place, (which circumſtance had perhaps no influence on the Succeſſe,) and having diſtill'd it out of a Glaſs Retort, the Event anſwer'd our Expectation, and the Liquor, that came over, had a Sent; which, though very ſtrong, was quite differing both from that of the Mixture, and that of the Camphire; and in the remaining Body, though the Liquor and the Camphire it conſiſted of, were either both tranſparent, or the one tranſparent as a Liquor, and the other white, as tranſparent and colourleſſe Bodies are wont to be made by Contuſion: yet the remaining Maſs, which amounted to a good part of the Mixture, was not onely Opacous, but as black as Coal, in ſome places looking juſt like poliſhed

Jet; which is the more conſiderable, becauſe that though Vegetable Subſtances, that are not fluid, are wont to acquire a Blackneſs from the fire, yet neither do Liquors, that have already been diſtill'd, obtain that Colour upon Rediſtillation; neither have we, upon Tryal purpoſely made, found, that Camphire, expoſ'd to fire in a Retort, fitted with a Receiver, (which was the caſe of the preſent Experiment,) would at all acquire a Jetty Colour, but would either totally aſcend White, or afford *Flores*, and a *Caput mortuum* (as a vulgar Chymiſt would call the Remaines) of the ſame Colour, both in reſpect of one another, and in reſpect of the Camphire.

IX. And our Experiment afforded this notable *Phænomenon*, That though Oyl of Vitriol be a diſtill'd Liquor, and though Camphire be ſo very fugitive a Subſtance, that being left in the Air, it will, of it ſelf, fly all away; and therefore

Phyſicians and Druggiſts preſcribe the keeping it in Linſeeds or *Millium*, or other convenient Bodies, to hinder its Avolation; yet, by our Experiment, its Fugacity is ſo reſtrain'd, that not onely the *Caput mortuum* newly mention'd, endured a good fire in the Retort, before it was reduc'd to that pitchy Subſtance vve vvere lately mentioning, but having taken ſome of that ſubſtance out of the Retort, & order'd it, by a careful Workman, to be kept in a cloſely cover'd Crucible during ſome time in the fire; when it vvas brought me back, after the Pot had been kept red hot above half an hour, there remain'd a good quantity of the Matter, brittle, vvithout any ſmell of Camphire, and as black as ordinary Charcoal; ſo much do the Fixity and Volatility of Bodies depend upon Texture.

Experiment II.

AMong thoſe other Experiments of mine, *(Pyrophilus)* which tend to manifeſt, that new Qualities may be produc'd in Bodies, as the Effects of new Textures; I remember, ſome years ago, I writ for a Friend a whole Set of Tryals, that I had made about the Changes I could produce in Metals and Minerals, by the Intervention of Sublimate. But though the whole Tract, wherein they are recited, might be pertinent enough to our preſent Subject; yet reſerving other paſſages of it for other places, (eſpecially for our Notes upon thoſe particular Qualities, which they are moſt proper to illuſtrate,) it may at this time ſuffice me to ſend you a Tranſcript of what that Account contains, relating to Copper and Silver, the one a mean and fugitive, and the other a noble and fix'd Metal. For thoſe changes

Coloũr, Conſiſtence, Fuſibleneſſe, and other Qualities, which you will meet with in theſe Experiments, will afford us divers *Phænomena*, to ſhew what great Changes may be made, even in Bodies ſcarce corruptible, by one or more of thoſe three Catholick wayes of Natures working according to the Corpuſcular Principles, namely, the Acceſs, the Receſs, and the Tranſpoſition of the minute Particles of Matter.

As for my Method of changing the Texture of Copper, I confeſs it hath oftentimes ſeem'd ſtrange to me, that Chymiſts, plainly ſeeing the notable Effect, that Sublimate, diſtill'd from Antimony, has upon that Mineral, by opening it, and volatilizing it, (as we ſee it do in the making of what they are pleaſ'd to call *Mercurius vitæ*,) ſhould not have the Curioſity to try, whether or no Sublimate might not likewiſe produce, if not the ſame, yet a conſiderable

rable Change in other Mineral Bodies, there appearing no reaſon, or at leaſt there having been none given, that I know of, why the Referating Operation (if I may ſo ſpeak) of Sublimate, ſhould be confin'd to Antimony. Upon theſe Conſiderations, we were invited to endeavour to ſupply the Neglect we had obſerv'd in Chymiſts, of improving the Experiment of *Butyrum Antimonii*: and though an Indiſpoſition in point of Health, which befell us before we had made any great progreſs in our Enquiries, made us ſo ſhy of the Fumes of Sublimate and Minerals, that we neither did make all our Tryals ſo accurately, nor proſecute them ſo far as we would have done, had we been to deal with more innocent Materials: Yet we ſuppoſe, it will not be unwelcome to You, to receive from us a naked, but faithful, Narrative of our Proceedings; being apt to think, that you will therein find Inducements to carry on this

Experiment further then we have done, and to compleat what we have but begun.

Firſt then, we took half a pound of Copper plates, of about an Inch broad, and the thickneſs of a Grain of Wheat, (which we after found was too great,) and of an arbitrary length; then caſting a Pound of groſly beaten *Venetian* Sublimate into the bottom of a ſomewhat deep Glaſs Retort, we caſt in the Copper plates upon it, that the Fumes of the Sublimate might, in their Aſcenſion, be compell'd to act upon the incumbent Metal, and then placing this Retort, as deep as we well could, in a Sand Furnace, and adapting to it a ſmall Receiver, we adminiſter'd a Gradual fire ſeaven or eight hours, and at length for a while increaſ'd the heat, as much as we well could do in ſuch a Furnace. The ſucceſs of this Operation was as follows.

1. There came little or no Liquor at all over into the Receiver, but the Neck &

upper part of the Retort were Candied on the inſide, by reaſon of the copious Sublimate adhæring to them, which Sublimate weigh'd above Ten Ounces; in the Retort we found about two Ounces and a quarter of running Mercury, which had been ſuffer'd to revive by the acid Salts, which corroding the Copper, forſook the Quickſilver, whereto they had been in the Sublimate united.

2. Upon the increaſe of the fire, there was plainly heard a Noiſe, made by the melting Matter in the Retort, not unlike that of a boyling Pot, or of Vitriol, when being committed to a Calcining fire, it is firſt brought to flow. And this Noiſe we found to be a more conſtant Circumſtance of this Experiment, then the revification of part of the Mercury contain'd in the Sublimate; for upon another Tryal, made with the former proportion of Copper plates and Sublimate, we obſerv'd, during a very long while, ſuch a Noiſe as hath been already

mention'd, but the Operation being finiſh'd, we ſcarce found ſo much as a few Grains of rnnning Mercury, either in the Retort or Receiver.

3. We found the Metalline Lump, in the bottom of the Retort, to have been increaſ'd in weight ſomewhat more then (though not half an Ounce above) two Ounces; ſome of the Copper plates, lying at the bottom of the Maſs, retain'd yet their Figure and Malleableneſſe, which we aſcrib'd to their not having been thin enough to be ſufficiently wrought upon by the Sublimate: the Others, which were much the greater number, had wholly loſt their Metalline form, and were melted into a very brittle Lump, which I can compare to nothing more fitly, then a lump of good Benjamin, for this Maſs, though ponderous, was no leſs brittle, and being broken, appear'd of divers Colours, which ſeem'd to be almoſt tranſparent, in ſome places it was red, in others of a

high and pleaſant Amber Colour, and in other parts of it, Colours more darkiſh and mix'd might be diſcern'd.

4. But this ſtrange Maſs being broken into ſmaller Lumps, and laid upon a Sheet of White Paper in a Window, was, by the next morning, where ever the Air came at it, all cover'd with a lovely greeniſh Blew, or rather, blewiſh Green, almoſt like that of the beſt Verdegreeſe, and the longer it lay in the air, the more of the internal parts of the Fragments did paſs into the ſame Colour: but the vvhite Paper, which in ſome places they ſtain'd, ſeem Dy'd of a Green colour inclining unto Yellow. And here we had Occaſion to take notice of the inſinuating ſubtlety of the Air; for having put ſome pieces of this Cupreous Gum (if I may ſo call it) into a little Box, to ſhut out the Air, which vve have found it poſſible to exclude by other means, vve found, that notwithſtanding our care, thoſe included

Fragments were, as well as the reſt already mention'd, covered with the powder, as it were of *viride Æris.*

5. We muſt not, on this Occaſion, omit to tell you, that, having, the laſt year, made ſome Tryals in reference to this Experiment, we obſerv'd in one of them, that ſome little Copper plates, from which Sublimate had been drawn off, retain'd their priſtine ſhape, and Metalline nature, but were Whitened over like Silver, and continu'd ſo for divers Months, (though we cannot preciſely tell you hovv long, having at length accidentally loſt them.) And to try vvhether this Whiteneſs vvere onely ſuperficial, vve purpoſely broke ſome of theſe flexible Plates, and found, that this Silver colour had penetrated them throughout, and vvas more glorious in the very Body of the Metal, then on its Surface, vvhich made us ſuſpect, that the Sublimate, by us imploy'd, had been adulterated vvith Arſenick, (vvherevvith

with the Sophiſticators of Metals are wont to make Blanchers for Copper, but not to mention, that the Malleableneſſe continu'd, which Arſenick is wont to deſtroy,)we diſcover'd not by Tryal, that the Sublimate was other then ſincere.

6. In this Metalline Gum the Body of the Copper appear'd ſo chang'd and open'd, that we were invited to look upon ſuch a Change as no ignoble Experiment, conſidering the Difficulty, which the beſt Artiſts tell us there is, and which thoſe,that have attempted it, have found, I ſay not, to unlock the Sulphur of Venus, but to effect leſſe Changes in its Texture, then was hereby made. For this Gum, caſt upon a quick Coal, and a little blown, will partly melt and flow like Roſin, and partly flame, and burn like a Sulphur, and with a flame ſo laſting, if it be rekindled as often as it leaves off burning, that we obſerv'd it, not without ſome

Wonde; and ſo inflammable is this opened Copper, that, being held to the flame of a Candle, or a piece of lighted Paper, it would almoſt in a moment take fire, and ſend forth a flame like common Sulphur, but onely that it ſeem'd to us to incline much more to a greeniſh colour, then the blewer flame of Brimſtone is wont to do.

To theſe *Phænomena* of our Experiment, as it was made with Copper, my Notes inable me to ſubjoyn ſome others, exhibited when we made it with Sublimate and Silver.

There were taken of the pureſt ſort of Coined Silver we could get, half a ſcore thin Plates, on which vvas caſt double the vveight of Sublimate in a ſmall and ſtrongly coated Retort. This Matter being ſublim'd in a naked fire, vve found, (having broken the Veſſel,) that the Sublimate vvas almoſt totally aſcended to the top and neck of the Retort, in the latter of vvhich appear'd in many places ſome reviv'd Mercury, in the bottom of the Retort we found a little fluxed Lump of Matter, which 'twas ſcarce poſſible to ſeparate from the Glaſs, but having, with much adoe divorc'd them, we found this Maſs to be brittle, of a pale yellowiſh colour, of neer about the weight of the Metal, on which the Sublimate had been caſt. And in the thicker part of this Lump there appear'd, when it was broken, ſome part of the Silver plates, vvhich, though brittle, ſeem'd not to have been perfectly diſſolv'd. This Reſin of Silver did, like that of Copper, but more ſlowly, imbibe the Moiſture of the Air, and vvithin about 24 hours, vvas cover'd vvith a ſomevvhat greeniſh Duſt, concerning vvhich vve durſt not determine, vvhether it proceeded from that mixture of Copper, vvhich is generally to be met vvith in coyned Silver, or from the compounded Metal. For the more curious ſort of Painters do, as they inform us, by corroding coined Silver vvith the fretting ſteams of ſaline Bodies, or vvith corroſive Bodies themſelves, turn it into a fine kind of Azure, as we may elſevvhere have opportunity more particularly to declare. I ſhall novv onely adde, that ſome ſmall fragments of our Reſin, being caſt upon red hot Coals, did there vvaſt themſelves in a flame not very differing in colour from that of the former mention'd Reſin of Copper, but much more durable then vvould have eaſily been expected from ſo ſmall a quantity of Matter.

This is all the Account I can give you of our firſt Tryal, but ſuſpecting, that the Copper, vvont to be mixt as an Alloy vvith our coyned Silver, might have too much Influence on the recited Event; coming aftervvards into a place, vvhere vve could procure Refin'd Silver, vve took an Ounce of That, and having Laminated it, vve caſt it upon tvvice its Weight of beaten Sublimate, which being driven away from it with a ſomewhat ſtrong fire, we took, out of the bottom of the Glaſs Retort, a Lump of Matter, which in ſome places, where it lay next the Glaſſe, was as it were ſilver'd over very finely, but ſo very thinly, that the Thickneſſe of the Silver ſcarce equall'd that of fine white Paper; the reſt of the Metal (except a little that lay undiſſolv'd almoſt in the middle of the Maſſe, becauſe, as we ſuppoſ'd, the Plates had not been beaten, till they were ſufficiently and equally thin,) having been, by the ſaline part of the Sublimate, that ſtuck to it, colliquated into a Maſs, that look'd not at all like Silver, or ſo much as any other Metal or Mineral.

And tis remarkable, that though Silver be a fixt Metal, and accounted indeſtructible, yet it ſhould by ſo ſlight an Operation, and by but about a quarter of its vveight of Additament, (as appear'd by weighing the whole Lump,)

be

be ſo ſtrangely diſguized, and have its Qualities ſo alter'd.

For (firſt) though an eminent Whiteneſſe be accounted the colour, which belongs to pure Silver, and though beaten Sublimate be alſo eminently White; yet the Maſs, we are ſpeaking of, was partly of a Lemmon or Amber colour, or a deep Amethyſtinine colour, aud partly of ſo dark a one, as it ſeem'd black: and it was pretty, that ſometimes in a fragment, that ſeem'd to be one continued and entire piece, the upper part would be of a light Yellow, vvhich abruptly ending, the lower vvas of a colour ſo obſcure, as ſcarce to challenge any name diſtinct from Black.

Next whereas Silver is one of the moſt Opacous Bodies in Nature, and Sublimate a White one, the produc'd Maſs was in great part Tranſparent, though not like Glaſs, yet like good Amber.

Thirdly, the Texture of the Silver

was exceedingly alter'd: for our Maſs, inſtead of being Malleable and Flexible, as that Metal is very much, appear'd, if you went about to cut it with a Knife, like Horn, yet otherwiſe eaſily apt to crack and break, though not at all to bend.

Fourthly, whereas Silver will indure Ignition for a good while before it be brought to Fuſion, our Mixture will eaſily melt, not onely upon quick coals, but in the flame of a Candle; but this Reſin, or Gum (if I may ſo call it) of our fix'd Metal did not, like that, we formerly deſcrib'd, of Copper, tinge the flame of a Candle, or produce with the glowing coals, on which tis laid, either a green or blewiſh colour.

And (*Pyrophilus*) to diſcover how much theſe Operations of the Sublimate upon Copper and Silver depend upon the particular Textures of theſe Bodies, I took two parcels of Gold, the one common Gold thinly laminated, and the other very well refin'd, and having caſt each of theſe in a diſtinct Urinal, upon no leſs then thrice its weight of groſly beaten Sublimate, I cauſ'd this laſt nam'd ſubſtance to be, in a Sand furnace, elevated from the Gold, but found not, that either of the two Parcels of that Metal was manifeſtly alter'd thereby: whether in caſe the Gold had been reduc'd to very minute particles, ſome kind of change (perhaps, if any differing enough from thoſe lately recited to have been made in the Copper and the Silver) might have been made in it, I am not ſo abſolutely certain; but I am confident, that by what I reſerve to tell you hereafter of Sublimates Operation upon ſome other Minerals, eſpecially Tin, it will appear, that That Operation depends very much upon the particular Texture of the Body, from whence that Sublimate is Elevated.

Before I diſmiſs this ſubject, *Pyrophilus*, I muſt not conceale from you, that in the Papers, whence theſe Experiments made with Sublimate have been tranſcribed, I annex'd to the whole Diſcourſe a few Advertiſements, whereof the firſt was, That I was reduc'd, in thoſe Experiments, to imploy, for want of a better, a Sand Furnace, wherein I could not give ſo ſtrong a fire as I deſir'd, which circumſtance may have had ſome Influence upon the recited *Phænomena*; and among other Advertiſements there being one, that will not be impertinent to my preſent Deſign, and may poſſibly afford a not unſucceſful Hint, I ſhall ſubjoin it in the words, wherein I find it deliver'd.

The next thing, of which I am to advertiſe you, is this, That this Experiment may probably be further improv'd, by imploying about it various and new kinds of Sublimate, and that ſeveral other things may be ſublim'd up together either with crude Mercury, or with common Sublimate, he that conſiders the way of making vulgar Sublimate, will not, I ſuppoſe, deny. To give you onely one Inſtance, I ſhall inform you, that, having cauſ'd about equal parts of common Sublimate and Sal Armoniack to be well powder'd and incorporated, by ſubliming the Mixture in ſtrong and large Urinals plac'd in a Sand Furnace, we obtain'd a new kind of Sublimate, differing from the former, which we manifeſted *ad Oculum*, by diſſolving a little of it and a little of common Sublimate ſeverally in fair water; for dropping a little reſolv'd ſalt of Tartar upon the ſolution of common Sublimate, it immediately turn'd of an Orange tawny colour, but dropping the ſame Liquor upon the ſolution of the Ammoniack Sublimate, if I may ſo call it, it preſently turn'd into a Liquor in Whiteneſſe reſembling Milk: And having from 4 ounces of Copper plates drawn *6* ounces of this new Sublimate after the already often recited manner, we had indeed in the bottom of the Retort a Cupreous Reſin, not much unlike That, made by Copper and common Sublimate; and this Reſin did, like the other, in the moiſt Air, ſoon begin to degenerate into a kind of Verdigreeſe. But that which was ſingular in this Operation was, that not onely ſome of the Sublimate had carried up, to a good height, enough of the Copper to be manifeſtly colour'd by it of a fine blewiſh Green, but into the Receiver there was paſs'd neer an Ounce of Liquor, that ſmelt almoſt like ſpirit of Sal Armoniack, and was tincted like the Sublimate, ſo that we ſuppoſ'd the Body of the Venus to have been better wrought upon by this, then by the former Sublimate. And yet I judg'd not this way to be the moſt effectual way of improving common Sublimate, being apt to think, upon grounds not now to be mention'd, that it may, by convenient Liquors, be ſo far enrich'd and advanc'd, as to be made capable of opening the Compact Body of Gold it ſelf, and of producing in it ſuch Changes, (which yet perhaps will enrich but mens Underſtandings,) as Chymiſts are wont very fruitleſly to attempt to make in that almoſt Indeſtructible Metal. But of This, having now given you a Hint, I dare here ſay no more.

Experiment III.

THere is (*Pyrophilus*) another Experiment, which many wil find more eaſie to be put in practice, and which yet may, as to Silver, be made a kind of *ſuccedaneum* to the former, and conſequently may ſerve to ſhew, how the like Qualities in Bodies may be effected by differing Wayes, provided a like Change of Texture be produc'd by them. Of This I ſhall give you an Example in that Preparation of Silver, that ſome Chymiſts have call'd *Luna Cornea*, which I ſhall not ſcruple to mention particularly, and apply to my preſent purpoſe; becauſe though the name of *Luna Cornea* be already to be met with in the Writings of ſome Alchymiſts, yet the thing it ſelf, being not uſ'd in Phyſick, is not wont to be known by thoſe that learn Chymiſtry in order to Phyſick; and the way that I uſe in making it is differing from that of Alchymiſts, being purpoſely deſign'd to ſhew ſome notable *Phænomena*, not to be met with in their way of proceeding.

We take then refined Silver, and having beaten it into thin Plates, and diſſolv'd it in abont twice its Weight of good *Aqua fortis*, we Filtrate it carefully to obtain a clear ſolution, (which ſometimes we Evaporate further, till it ſhoot into Chryſtals, which we afterwards dry upon brown Paper with a moderate heat.)

Upon the abovemention'd ſolution we drop good ſpirit of Salt, till we find, that it will no more curdle the Liquor it falls into, (which will not happen ſo ſoon, as you will be apt at firſt to imagine,) then we put the whole Mixture in a Glaſs Funnel lin'd with Cap-paper, and letting the moiſture drain through, we dry, with a gentle heat, the ſubſtance, that remains in the Filtre, firſt waſhing it (it need be) from the looſly adhæring Salts, by letting fair Water run through it ſeveral times, whilſt it yet continues in the Filtre. This ſubſtance being well dry'd, we put it into a Glaſs Viol, which being put upon quick coals, firſt cover'd with Aſhes, and then freed from them, we melt the contain'd ſubſtance into a Maſs, which, being kept a while in Fuſion, gives us the *Luna Cornea* we are now to conſider.

If to make this Factitious Concrete, we firſt reduce the Silver into Chryſtals, and afterwards proceed with ſpirit of Salt, as we have juſt now taught you to do with the ſolution, we have the exceedingly Opacous, Malleable, and hardly Fuſible Body of Silver, by the convenient interpoſition of ſome ſaline Particles, not amounting to the third part of the Weight of the Metal, reduc'd into Chryſtals, that both ſhoot in a peculiar and determinate figure, differing from thoſe of other Metals, and alſo are diaphanous and brittle, and by great odds more eaſily fuſible then Silver it ſelf; beſides other Qualities, wherein having elſewhere taken notice, that theſe Chryſtals differ both from Silver and from *Aqua fortis*, we ſhall not now inſiſt on them, but paſs to the Qualities, that do more properly belong to the change of the Solution of Silver into *Luna Cornea*.

Firſt then we may obſerve, that though ſpirit of Salt be an highly acid Liquor, and though acid Liquors and *Alkalys* are wont to have quite contrary Operations, the one præcipitating what the other would diſſolve, & diſſolving what the other would præcipitate: yet in our caſe, as neither Oyl of Tartar *per deliquium*, nor ſpirit of Salt will diſſolve Silver, ſo both the one and the other will præcipitate it; which I deſire may be taken notice of againſt the Doctrine of the Vulgar Chymiſts, and as a Proof, that the Præcipitation of Bodies depends not upon acid or Alkalizate Liquors as ſuch, but upon the Texture of the Bodies, that happen to be confounded.

2. We may here obſerve, that Whiteneſs and Opacity may be immediately produc'd by Liquors, both of them Diaphanous and colourleſs.

3. That on the other ſide, a White Powder, though its minute parts appear not tranſparent, like thoſe of beaten Glaſs, Roſin, &c. which, by comminution, are made to ſeem White, may yet, by a gentle heat, be preſently reduc'd into a Maſs indifferently Tranſparent, and not at all White, but of a fair Yellow.

4. We may obſerve too, that though Silver require ſo ſtrong a fire to melt it, and may be long kept red hot, without being brought to Fuſion; yet by the aſſociation of ſome ſaline particles, conveniently mingled with it,it may be made ſo fuſible, as to be eaſily and quickly melted, either in a thin Viol, or at the flame of a Candle, where it will flow almoſt like Wax.

5. It may alſo be noted,that though the Lunar ſolution and the ſpirit of Salt would, either of them apart, have readily diſſolv'd in Water; yet when they are mingled, they do, for the moſt part, concoagulate into a ſubſtance, that will lie undiſſolv'd in Water, and is ſcarce, if at all, ſoluble either in *Aqua fortis*, or in ſpirit of Salt.

6. And remarkable it is, that the Body of Silver being very flexible and malleable, (eſpecially if the Metal be, as ours was, refin'd) it ſhould yet, by the Addition of ſo ſmall a proportion of

Salt, (a Body rigid and brittle,) as is aſſociated to it in our Experiment, be made of a Texture ſo differing from what either of its Ingredients was before, being wholly unlike either a Salt or a Metal, and very like in Texture to a piece of Horn. And to ſatisfie my ſelf, how much the Toughneſs of this Metalline Horn depended upon the Texture of the *Compoſitum*, reſulting from the reſpective Textures of the ſeveral Ingredients, I præcipitated a ſolution of Silver with the diſtill'd ſaline Liquor commonly call'd Oyl of Vitriol, inſtead of ſpirit of ſalt, and having waſh'd the Præcipitate with common Water, I found agreeably to my conjecture, that this Præcipitate, being flux'd in a moderate heat, afforded a Maſs, that look'd like enough to the Concrete we have been diſcourſing of, but had not its Toughneſs, being brittle enough to be eaſily broken in pieces. But the two conſiderableſt *Phænomena* of our

Experiment do yet remain unmentiond.

For 7thly. Tis odd, that whereas a ſolution of Silver is, as we have often occaſion to note, the bittereſt Liquor we have ever met with, and the ſpirit of Salt far ſowrer then either the ſharpeſt Vinegar, or even the ſpirit of it, theſe two ſo ſtrongly and offenſively taſted Liquors ſhould be ſo eaſily and ſpeedily, without any other thing to correct them, be reduc'd into an inſipid ſubſtance, (at leaſt ſo far inſipid, that I have lick'd it ſeveral times with my Tongue, without finding it otherwiſe, though perhaps, with much rowling it to and fro in the mouth, it may at length afford ſome unpleaſant Taſt, but exceedingly different from that of either of the Liquors that compoſ'd it:) and This, though the Salts, that made both the Silver, and the præcipitating ſpirit ſo ſtrongly taſted, remaine aſſociated with the Silver.

8. And Laſtly, it is very ſtrange,

that though the ſaline Corpuſcles, that give the efficacy both to good *Aqua fortis*, and the like ſpirit of Salt, be not onely ſo volatile, that they will eaſily be diſtill'd with a moderate fire, but ſo fugitive, that they will in part fly away of themſelves in the cold Air, (as our Noſes can witneſs to our trouble, when the Viols, that contain ſuch Liquors, are unſtopt;) yet by vertue of the new Texture they acquire, by aſſociating themſelves with the Corpuſcles of the Silver and with one another, theſe minute particles of ſalt looſe ſo much of their former Lightneſs, and acquire ſuch a degree of Fixedneſſe, that they will endure melting with the Metal they adhere to, rather then ſuffer themſelves to be driven away from it. Nor do I remember, that when I melted this Maſs in a thin Viol, I could perceive any ſenſible Evaporation of the Matter: nay having afterwards put a parcel of it upon a quick Coal, though that were blown to intend the heat; yet it ſuffer'd Fuſion, and ſo ran off from the Coal, without appearing, when it was taken up again, to be other then *Luna Cornea*, as it was before.

Experiment IV.

I Am now (*Pyrophilus*) about to do a Thing, contrary enough both to my Cuſtome and Inclination, that is, To diſcourſe upon the *Phænomena* of an Experiment, which I do not teach you to make. But ſince I cannot as yet, without ſome breach of promiſe, plainly diſcloſe to you what I muſt now conceal, your Equity aſſures me of your Pardon. And as, becauſe the Qualities of the Salt, I am to ſpeak of, are very remarkable, and pertinent to my preſent deſign, I am unwilling to paſs them by unmention'd; ſo I hope, that notwithſtanding their being ſtrange, I may be allow'd to diſcourſe upon them to you,

vvho,

who, I preſume, know me too well to ſuſpect I would impoſe upon you in matters of fact, and to whom I am willing (if you deſire it) to ſhew the Anomalous Salt it ſelf, and Ocular proofs of the chief properties I aſcribe to it.

I ſhall not then ſcruple to tell you, that Diſcourſing one day with a very Ingenious Traveller and Chymiſt, who had had extraordinary Opportunities to acquire Secrets, of a certain odd Salt I had thought upon and made, which was of ſo differing a kind from other Salts, that though I did not yet know what Feats I ſhould be able to do with it, yet I was confident, it muſt have Noble and unuſual Operations. This Gentleman, to requite my Francknesſ, told me, that I had lighted on a greater Jewel, then perhaps I was aware of; and that if I would follow his Advice, by adding ſomething that he nam'd to me, and proſecuting the Preparation a little further, I ſhould obtain a Salt exceedingly noble. I thank'd him,as I had cauſe, for his Advice, and, when I had Opportunity,follow'd it. And though I found the vvay of making this Salt ſo nice and intricate a thing, that if I vvould,I could ſcarce eaſily deſcribe it, ſo as to enable moſt men to practice it;yet having once made it, I found, that, beſides ſome of the things I had been told it would perform, I could do divers other things vvith it, vvhich I had good cauſe to believe the Gentleman, of whom I was ſpeaking,did not think of; and I doubt not, but I ſhould have done much more with it, if I had not unfortunately loſt it ſoon after I had prepar'd it.

Several of the *Phænomena*, I try'd to produce with it, which are not ſo proper for this place, are reſerv'd for another, but here I ſhall mention a few,that beſt fit my preſent purpoſe.

Firſt then, though the ſeveral Ingredients,that compoſ'd this Salt,were all of them ſuch, as Vulgar Chymiſts muſt according to their Principles, look upon as purely Saline, and were each of them far more ſalt then Brine, or more ſowr then the ſtrongeſt Vinegar, or more ſtrongly taſted then either of thoſe two Liquors; yet the Compound, made up of onely ſuch Bodies, is ſo far from being eminently ſalt, or ſowr, or inſipid, that a Stranger being ask'd, what Taſt it had, vvould not ſcruple to judge it rather ſweet, then of any other Taſt: though its Sweetneſs be of a peculiar kind, as there is a difference even among Bodies ſweet by Nature; the ſweetneſs of Sugar being divers from that of Honey, and both of them differing from that of the ſweet Vitriol of Lead. And this is the onely inſtance, I remember, I have hitherto met vvith of Salts, that, vvithout the mixture of inſipid Bodies, compoſe a ſubſtance *really ſweet*. I ſay *really ſweet*, becauſe Chymiſts oftentimes terme the *Calces* of Metals and other Bodies *dulcifi'd*, if they be freed from all corroſive ſalts and ſharpneſs of Taſt, *ſweet*, though they have nothing at all of poſitive ſweetneſs in them; and by that licence of ſpeaking do often enough impoſe upon the Unskilful.

Another thing conſiderable in our Anomalous Salt is, That though its Odour be not either ſtrong or offenſive, (both which that of Volatile Salts is wont to be,) yet if it be a little urg'd with heat, ſo as to be forc'd to evaporate haſtily and copiouſly, I have known ſome, that have been uſ'd to the powerful ſtink of *Aqua fortis*, diſtill'd Urine, and even ſpirit of Sal Armoniack its ſelf, that have complain'd of this ſmell, as more ſtrong, and upon that account more unſupportable then theſe themſelves: and yet when theſe Fumes ſettle again into a Salt, their Odour will again prove mild and inoffenſive, if not pleaſant.

Thirdly, whereas all the Volatile, and Acid, and Lixiviate Salts, that we know of, are of ſo determinate and ſpecificated a Nature, (if I may ſo ſpeak,) that there is no one ſort of the three, but may be deſtroy'd by ſome one or other of the other two Salts, if not by both, as ſpirit of Urine, which is a volatile Salt, being mingled with ſpirit of Salt, or *Aqua fortis*, or almoſt any other ſtrong and acid ſpirit, will make a great Ebullition, and looſe its peculiar Taſt, and ſeveral of its other Qualities; and on the otherſide, Salt of Tartar, and other *Alkalys*, (that is, Salts produc'd by Incineration of mix'd Bodies,) will be deſtroy'd with Ebullition by *Aqua fortis*, ſpirit of Salt, or almoſt any other ſtrong ſpirit of that Family. And ſpirit of Salt, *Aqua fortis*, &c. will be (as they ſpeak) deſtroy'd both by Animal volatile Salts, and by the fix'd Salts of Vegetables; that is, will make an Effervеſcence with either ſort of Salts, and compoſe with them a new Liquor or Salt, differing from either of the ingredients, and, as to taſt, ſmell, odour, odoúr, and divers other Qualities, more languid and degenerous: whereas, I ſay, each of theſe three Families of Salts may be eaſily deſtroy'd by the other two, our Anomalous Salt ſeems to be above the being *thus wrought* upon by any of allthe three,and is the onely Body I know: (which is no ſmall priviledge, or rather prerogative,) for I did not find, that a Solution of it, made with as little Water as I could, which is the vvay whereby we uſually make it fluid, would make any Ebullition, either with Oyl of Tartar *per Deliqnium*, or ſpirit of Sal Armoniack, or ſtrong ſpirit of Salt, or even Oyl of Vitriol, but would calmely and ſilently mix vvith theſe differing Liquors, and continue as long as I had patience to look upon them, without being præcipitated by them. But this is not the onely way I imploy'd to examine, whether our Salt belong'd to any of the three above mention'd comprehenſive families of Salts. For

I found not, that the ſtrongeſt ſolution of it would turn Syrup of Violets either red, as acid ſpirits do, or green, as both fix'd and volatile Salts will do. Nor would our Solution turn a clear one of Sublimate made in common Water, either white, as ſpirit of Urine, Sal Armoniack, or others of the ſame family, or into an Orange Tawny, like ſalt of Tartar, and other *Alkalys*: but left the ſolution of Sublimate tranſparent, without giving it any of theſe colours, mingling it ſelf very kindly with it, as it had done with the four lately mention'd Liquors. And to ſatisfy my ſelf a little further, I not onely try'd, that an undiſcolour'd mixture of ſyrup of Violets and our ſolution, would immediately be turn'd red by 2 or 3 drops of ſpirit of Salt, or green by as much Oyl of Tartar: but, to proſecute the Experiment, I let fall a drop or two of a mixture made of our Anomalous ſolution, and ſpirit of Salt well ſhaken together, upon ſome ſyrup of Violets, which was thereby immediately turn'd red, and a little of the ſame Anomalous ſolution, being ſhaken together with Oyl of Tartar *per Deliquium*, turn'd another parcel of the ſame ſyrup of Violets into a delightful green, which, hapning as *I* expected, ſeem'd to argue, that our Solution, though as to ſenſe it were exquiſitely mingled in the ſeveral mixtures, to which *I* had put it, did, as it left them their undeſtroy'd reſpective Natures, retain its own; and yet this Salt is ſo far from being a languid or an inſignificant thing, that *Aqua fortis*, and Oyl of Vitriol themſelves, as operative and as furious Liquors as they are, are unable in divers caſes to make ſuch Solutions, and perform ſuch other things, as our calme, but powerful, Menſtruum can, though but ſlowly, effect.

Fourthly: Though this Salt be a volatile one, and requires no ſtrong heat to make it ſublime into finely figur'd

Chryſtals without a remanence at the Bottom; yet being diſſolv'd in Liquors, you may make the Solution, if need be, to boile, without making any of the Salt ſublime up, before the Liquor be totally or almoſt totally drawn off, whereas the volatile ſalt of Urine, Bloud, Harts-horn, &c. are wont to aſcend before almoſt any part of the Liquor, they are diſſolv'd in, which is in many caſes very inconvenient.

And though this be a Volatile ſalt, yet I remember not, that *I* have obſerv'd any fix'd ſalt, (without excepting ſalt of Tartar it ſelf,) that runs near ſo ſoon *per Deliquium*, as this will do; but by abſtraction of the adventitious moiſture tis eaſily reſtor'd to its former ſaline form: and yet differs from ſalt of Tartar, not onely in Fixedneſſe and Taſt, and divers other qualities, but alſo in this, That, whereas ſalt of Tartar requires a vehement fire to flux it, a gentlier heat, then one would eaſily imagine,

gine, will melt our Salt into a Limpid Liquor.

And whereas ſpirit of Wine will diſſolve ſome Bodies, as Sanderick, Maſtick, Gum-Lac, &c. and Water, on the other ſide, diſſolves many that ſpirit of Wine cannot, and Oyls will diſſolve ſome, for which neither of the other Liquors are good ſolvents; our ſalt will readily diſſolve both in fair Water, in the higheſt rectifi'd ſpirit of Wine, (and That ſo little, as not to weigh more then the ſalt,) and in Chymical Oyls themſelves, with which it will aſſociate its ſelf very ſtrictly, and perhaps more too, then *I* have yet found any other conſiſtent ſalt to do.

Experiment V.

THe Experiment *I* am (*Pyrophilus*) now about to deliver, though I have not yet had Opportunity to perfect what *I* deſign'd, when ſome Notions,that I have about Fire and Salt,ſuggeſted it to me, is yet ſuch as may far more clearly,then almoſt any of the Experiments commonly known to Chymiſts,ſerve to ſhew us, how near to a real Tranſmutation thoſe Changes may prove, that may be effected even in inanimate, and, which is more, ſcarce corruptible Bodies, by the receſs of ſome Particles,and the acceſs of ſome others, and the new Texture of the reſidue. The Experiment I have made ſeveral wayes, but one of the lateſt and beſt I have uſ'd is this: Take one part of good Sea-ſalt well dry'd and powder'd, and put to it double its weight of good *Aqua fortis*, or ſpirit of Nitre, then haveing kept it (if you have time) for ſome while in a previous digeſtion, diſtill it over with a ſlow fire in a Retort or a low Body, till the the remaining Matter be quite dry, and no more; for this ſubſtance, that will remain in the bottom of the Glaſs, is the thing that is ſought for.

This Operation being performable in a moderate fire, and the Bodies themſelves being almoſt of an incorruptible nature, one would ſcarce think, that ſo ſlight a matter ſhould produce any Change in them; but yet I found, as I expected, theſe notable Mutations of Qualities effected by ſo unpromiſing a way.

For in the firſt place, we may take notice, that the Liquor, that came over, was no longer an *Aqua fortis*, or ſpirit of Nitre, but an *Aqua Regis*, that was able to diſſolve Gold, which *Aqua fortis* will not meddle with, and will not diſſolve Silver, as it would have done before, but will rather, as I have purpoſely try'd, præcipitate it out of *Aqua fortis*, if that Menſtruum have already diſſolv'd it: but this Change belonging not ſo properly to the ſubſtance it ſelf I was about to conſider, I ſhall not here inſiſt on it.

2. Then, the Taſt of this Subſtance

comes by this Operation to be very much alter'd. For it hath not that ſtrong ſaltneſs that it had before, but taſts far milder, and, though it relliſh of both, affects the Palate much more like Salt-petre, then like common ſalt.

3. Next, whereas this laſt nam'd Body is of very difficult Fuſion, our factitious ſalt imitates ſalt-petre in being very fuſible, and it will, like Nitre, ſoon melt, by being held in the flame of a Candle.

4. But to proceed to a more conſiderable *Phænomenon*, tis known, that Sea-ſalt is a Body, that doth very much reſiſt the fire, when once by being brought to Fuſion, it hath been forc'd to let go that windy ſubſtance, that makes unbeaten ſalt crackle in the fire, and ſo by blowing it accidentally increaſe it. Tis alſo known, that acid ſpirits, as thoſe of Salt, Vitriol, Nitre, Vinegar, &c. are not onely not inflammable themſelves, but hinderers of inflam-

mation in other Bodies; and yet my Conjecture leading me to expect, that, by this Operation, I ſhould be able to produce, out of two inflammable Bodies, a third, that would be eaſily inflammable. I found, upon Tryal, not onely that ſmall Lumps of this ſubſtance, caſt upon quick and well blown coals, though they did not give ſo blew a flame as Nitre, did yet, like it, burn away with a copious and vehement flame. And, for further Tryal, having melted a pretty quantity of this tranſmuted Sea ſalt in a Crucible, by caſting upon It little fragments of well kindled Charcoal, it would, like Nitre, preſently be kindled, and afford a flame ſo vehement and ſo dazling, that one that had better Eyes then I, and knew not what it was, complain'd, that he was not able to ſupport the ſplendor of it. Nor were all its inflammable parts conſum'd at one deflagration: for by caſting in more fragments of well kindled Coal, the Matter would fall a puffing, and flame afreſh for ſeveral times conſecutively, according to the quantity that had been put into the Crucible.

5. But this it ſelf was not the chief diſcovery I deſign'd by this Experiment. For I pretended hereby to deviſe a way of turning an acid ſalt into an *Alkaly*, which ſeems to be one of the greateſt and difficulteſt Changes, that is rationally to be attempted among durable and inanimate Bodies. For tis not unknown to ſuch Chymiſts as are any thing inquiſitive and heedful, how vaſt a difference there is between acid Salts, and thoſe, that are made by the combuſtion of Bodies, and are ſometimes call'd Fix'd, ſometimes Alkalizate. For whereas ſtrong Lixiviums (which are but ſtrong ſolutions of *Alkalys*) will readily enough diſſolve common Sulphur, and divers other Bodies abounding with Sulphur; even thoſe highly acid Liquors, *Aqua fortis*, and *Aqua*

Regis, though ſo corroſive, that one will diſſolve Silver, and the other Gold it ſelf, will let Brimſtone lye in them undiſſolv'd I know not how long; though ſome ſay, that in proceſs of time, there may be ſome Tincture drawn by the Menſtruum from it, which yet I have not ſeen try'd; and though it were true, would yet ſufficiently argue a great diſparity betwixt thoſe acid ſpirits, and ſtrong Alkalizate ſolutions, which will ſpeedily diſſolve the very maſſe of common Sulphur. Beſides, tis obſerv'd by the inquiſitive Chymiſts, nor does my Experience contradict it, that the Bodies, that are diſſolv'd by an acid Menſtruum, may be præcipitated by an Alkalizate; and on the contrary, ſolutions, made by the latter, may be præcipitated by the former. Moreover, as Litharge, diſſolv'd in ſpirit of Vinegar, will be præcipitated by the Oyl of Tartar *per Deliquium*, or the ſolution of its Salt; and, on the contrary, Sulphur or

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Antimony, diſſolv'd in ſuch a ſolution, will be præcipitated out of it by the ſpirit of Vinegar, or even common Vinegar. Moreover, Acids and Alkalizates do alſo differ exceedingly in taſt, and in this greater diſparity, that the one is volatile, and the other fix'd, beſides other particulars not neceſſary here to be inſiſted on. And indeed, if that were true, which is taught in the Schools, that there is a natural enmity, as well as diſparity betwixt ſome Bodies, as between Oyly and wateriſh ones, the Chymiſts may very ſpeciouſly teach, (as ſome of them do) That there is a ſtrange contrariety betwixt Acid and Alkalizate Salts; as when there is made an Affuſion of oyl of Tartar upon *Aqua Regis*, or *Aqua fortis*, to præcipitate Gold out of the one, and Silver out of the other, their mutual Hoſtility ſeems manifeſtly to ſhew its ſelf, not onely by the noiſe, and heat, and fume, that are immediately excited by their conflict, but by this moſt of all, that afterwards the two contending Bodies will appear to have mutually deſtroy'd one another, both the ſowr Spirit and the fixt Salt having each loſt its former Nature in the ſcuffle, and degenerated with its Adverſary into a certain Third ſubſtance, that wants ſeveral of the Properties both of the ſowr Spirit and the *Alkaly*. Now to apply all this to the Occaſion, on which I mention'd it, how diſtant and contrary ſoever the more inquiſitive of the latter Chymiſts take *Acid* and *Fixed* Salts to be; yet I ſcarce doubted, but that, by our Experiment, I ſhould, from acid ſalts, obtain an *Alkaly*, and accordingly having, by caſting in ſeveral bits of well kindled coal, excited, in the melted Maſs of our tranſmuted Salt, as many Deflagrations as I could, and then giving it a pretty ſtrong fire to drive away the reſt of the more fugitive parts, I judg'd, that the remaining Maſſe would be (like the fix'd

Nitre I have elſewhere mention'd) of an Alkalizate nature, and accordingly having taken it out, I found it to taſt, not like Sea-ſalt, but fiery enough upon the Tongue, and to have a Lixiviate reliſh. I found too, that it would turn Syrup of Violets into a greeniſh colour, that it would præcipitate a Limpid ſolution of Sublimate, made in fair water, into an Orange tawny Powder. I found, that it would, like other fix'd ſalts, produce an Ebullition with acid ſpirits, and even with ſpirit of ſalt it ſelf, and concoagulate with them. Nor are theſe themſelves all the wayes I took to maniſeſt the Alkalizate Nature of our tranſmuted Sea ſalt.

I did indeed conſider at firſt, that it might be ſuſpected, that this new Alkalizateneſſe might proceed from the Aſhes of the injected Coals, the Aſhes of Vegetables generally containing in them more or leſſe of a fix'd Salt. But when I conſider'd too, that a pound of

Charcoal, burn'd to Aſhes, is wont to yield ſo very little Salt, that the injected fragments of Coal, (though they had been, which they were not) quite burn'd out in this Operation, would ſcarce have afforded two or three grains of ſalt, (perhaps not half ſo much,) I ſaw no reaſon at all to believe, that in the whole Maſs I had obtain'd (and which was all, that was left me of the Sea-ſalt, I had at firſt imploy'd,) it was nothing but ſo inconſiderable a proportion of Aſhes, that exhibited all the *Phænomena* of an *Alkaly*.

And for further confirmation both of This, and what I ſaid a little before, I ſhall adde, that to ſatisfie my ſelf yet more, I pour'd, upon a pretty quantity of this Lixiviate ſalt, a due proportion of *Aqua fortis*, till the hiſſing and ebullition ceaſed, and then leaving the fluid Mixture for a good while to coagulate, (which it did very ſlowly,) I found it at length to ſhoot into ſaline Chryſtals,

ſtals, which though they were not of the figure of Nitre, did yet, by their inflammability and their bigneſs, ſufficiently argue, that there had been a Conjunction made betwixt the Nitrous ſpirit, and a conſiderable proportion of *Alkaly*.

I conſider'd alſo, that it might be ſuſpected, that in our Experiment twas the Nitrous Corpuſcles of the *Aqua fortis*, that, lodging themſelves in the little rooms deſerted by the ſaline Corpuſcles of the Sea-ſalt, that paſs'd over into the Receiver, had afforded this *Alkaly*; as common Salt-petre, being handled after ſuch a manner, would leave in the Crucible a fix'd or *Alkalizate* Salt. But to this I anſwer, that as the Sea-ſalt, which was not driven over by ſo mild a Diſtillation, and ſeem'd much a greater part then that which had paſs'd over, was far from being of an *Alkalizate* nature: ſo the Nitrous Corpuſcles, that are preſum'd to have ſtay'd behind, were whilſt they compos'd the ſpirit of Nitre, of an highly volatile and acid Nature, and conſequently of a nature directly oppoſite to that of *Alkalys*; and if by the addition of any other ſubſtance, that were no more *Alkalizate* then Sea-ſalt, an *Alkaly* could be obtain'd out of ſpirit of Nitre or *Aqua fortis*, the Produciblenefs of an *Alkaly* out of Bodies of another nature might be rightly thence inferr'd: ſo that however, it appears, that by the intervention of our Experiment, two Subſtances, that were formerly acid, are turn'd into one, that is manifeſtly of an *Alkalizate* Nature, which is That we would here evince.

Perhaps it may (*Pyrophilus*) be worth while to ſubjoyn; That to proſecute the Experiment by inverting it, we drew two parts of ſtrong ſpirit of Salt from one of purifi'd Nitre; but did not obſerve the remaining Body to be any thing neer ſo conſiderably chang'd as the Sea-ſalt, from which we had drawn the ſpirit of Nitre; ſince though the ſpirit of Salt, that came over, did (as we expected) bring over ſo many of the Corpuſcles of the Nitre, that, being heated, it would readily enough diſſolve foliated Gold; yet the Salt, that remain'd in the Retort, being put upon quick Coals, did flaſh away with a vehement and halituous flame, very like that of common Nitre.

Experiment VI.

I Come now (*Pyrophilus*) to an Experiment, which, though in ſome things it be of kin to that which I have already taught you, concerning the changing of Sea-ſalt by *Aqua fortis*, will yet afford us divers other inſtances, to ſhew, how upon the change of Texture in Bodies, there may ariſe divers new Qualities; eſpecially of that ſort, which, becauſe they are chiefly produc'd by Chymiſtry, and are wont to be conſider'd der'd by Chymiſts, if not by Them onely, may in ſome ſenſe be call'd Chymical.

The Body, which, partly whilſt we were preparing it, and partly when we had prepar'd it, afforded us theſe various *Phænomena*, either is the ſame that *Glauberus* means by his *Sal Mirabilis*, or at leaſt ſeems to be very like it: and whether it be the ſame or no, its various and uncommon Properties make it very fit to have a place allow'd it in this Treatiſe. Though of the many Tryals I made with it, I can at preſent find no more among my looſe Papers, then that following part of it, that I wrot ſome years ago to an Ingenious Friend, who I know will not be diſpleaſ'd, if, to ſave my ſelf ſome time, and the trouble of Examining my Memory, I annex the following Tranſcript of it.

[To give you a more particular account of what I writ to you from *Oxford* of my Tryals about *Glauber's* Salt, though I dare not ſay, that I have made the ſelf ſame Thing, which he cals his *Sal Mirabilis*, becauſe he has deſcrib'd it ſo darkly and ambiguouſly, that tis not eaſie to know with any certainty what he means; yet whether or no I have not made Salt, that, as far as I have yet try'd it, agrees well enough with what he delivers of His, and therefore is like to prove either his *Sal mirabilis*, or almoſt as good a one, I ſhall leave you to judge by this ſhort Narrative.

The ſtrange things that the Induſtrious *Glauber*'s Writings have invited Men to expect from his *Sal mirabilis*, in caſe he be indeed poſſeſſ'd of ſuch a thing, and the Enquiries of divers Eminent Men, who would fain learn of me, what I thought of its Reality and Nature, invited me, the next Opportunity I got, to take into my hands his *Pars altera Miraculi Mundi*, whoſe Title you know promiſes a Deſcription of this *Sal Artis mirificum*, as he is pleaſ'd to call it. But, I confeſs, I did not read it near all over, becauſe a great part of it is but a Tranſcription of ſeveral entire Chapters out of *Paracelſus*, and I perceiv'd, that much of the reſt did, according to the cuſtome or Chymical Writings, more concern the Author, then the ſubject; wherefore looking upon his proceſs of making his *ſal mirabilis*, I ſoon perceiv'd he had no mind to make it common, ſince he onely bids us upon two parts of common Salt diſſolv'd in common Water, to pour *A*, without telling us what that *A* is, wherefore reading on in the ſame proceſſe, and finding that he tels us, that with *B* (which he likewiſe explaines not at all, nor determines the quantity of it) one may make an *Aqua fortis*, it preſently call'd into my mind, That ſome Years before, having had Occaſion to make many Tryals, mention'd in other Tracts of mine, with Oyl of Vitriol and Salt petre, I did, among other things, make a red ſpirit of Nitre, by the help onely of Oyl of Vitriol; remembring This(I ſay) I reſorted to one of my *Carneades's* Dialogues,*and reviewing that Experiment, as I have ſet it down, I concluded, That though I had not diſſolv'd the Salt petre in Water, as *Glauber* doth his common Salt; yet ſince,on the other ſide, I made uſe of external fire, 'twas probable I might this way alſo get a Nitrous ſpirit, though not ſo ſtrong. And though by calling the Liquor, that muſt make an *Aqua fortis B*, whereas he had call'd that, which is to make his ſpirit of Salt and *ſal mirabilis, A*, he ſeem'd plainly to make them differing things, yet relying on the Experiment I had made, and putting to a ſolution of Nitre as much of the Oyl of Vitriol as I had taken laſt, though That be double the quantity he preſcribes for the making of his *Sal mirabilis*, I obtain'd, out of a low glaſſe Body and Head plac'd in Sand, an indifferent good *Spiritus Nitri*, that even before Rectification would readily enough diſſolve Silver, though it were diluted with as much of the common Water, wherein Salt-petre had been diſſolv'd, as amounted at leaſt to double or treble the weight of the Nitrous parts; the remaining Matter, being kept in the fire till it was dry, afforded us a Salt eaſily reducible (by Solution in fair Water and Coagulation)into Chryſtalline Grains, of a nature very differing both from crude Nitre, and from fixt Nitre, and from Oyl of Vitriol. For it coagulated into pretty big and well ſhap'd Grains; which, you know, fix'd Nitre and other *Alkalizate* Salts are not wont to do; and theſe Graines were not like the Chryſtals of Salt-petre it ſelf, long and Hexaedrical, but of another figure, not eaſie nor neceſſary to be here deſcribed.

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* See the Sceptical Chymiſt.

Beſides, this Vitriolate Nitre (if I may ſo call it) would not eaſily, if at all, flow in the Air, as fixt Nitre is vvont to do. Moreover, it was eaſily enough fuſible by heat, vvhereas fix'd Nitre doth uſually exact a vehement Fire for its Fuſion; and though crude Salt-petre alſo melts eaſily, yet to ſatisfie you how differing a ſubſtance this of ours was from That, vve caſt quick Coals into the Crucible, without being at all able to kindle it. Nay, and vvhen, for further Tryal, vve threw in ſome Sulphur alſo, though it did flame away it ſelf, yet did it not ſeem to kindle the Salt, that was hot enough to kindle It; much leſs did it flaſh, as Sulphur is wont on ſuch occaſions to make Salt-petre do. Add to all this, That a parcel of this white ſubſtance, being, vvithout Brimſtone, made to flow for a vvhile in a Crucible, with a bit of Charcoal for it to vvork upon, grew manifeſtly and ſtrongly ſented of Sulphur, and acquir'd an *Alkalizate* Taſt, ſo that it ſeem'd almoſt a Coal of fire upon the Tongue,

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if it were lick'd before it imbib'd any of the Aires moiſture, and (which many perhaps will, though I do not, think ſtranger) obtain'd alſo a very red colour; which recall'd to my mind, that *Glauber* mentions ſuch a Change obſervable in his Salt, made of common Salt, upon whoſe Account he is pleaſ'd to call ſuch a ſubſtance his *Carbunculus*.

Being invited by this ſucceſs to try, whether I could make his *Sal mirabilis*, notwithſtanding his intimating, as I lately told you, that it is done with a differing Menſtruum from that, wherewith the Salt-petre is to be wrought upon; I obſerv'd, that where he points at a way of making his Salt in quantity without breaking the Veſſels, he preſcribes, that the Materials be diſtill'd in Veſſels of pure Silver; vvhence I conjectur'd, that 'twas not *Aqua fortis*, or ſpirit of Nitre, that he imploy'd to open his Sea-ſalt: and that conſequently, ſince common ſpirit of Salt was too weak to effect ſo great a Change, as the Experiment requires, 'twas very probable, that he imploy'd Oyl of Sulphur, or of Vitriol, vvhich vvill ſcarce at all fret unalloy'd Silver. And however I concluded, that whatſoever the Event ſhould prove, it could not but be worth the While to try, vvhat Operation ſuch a Menſtruum vvould have upon Sea-ſalt, as I vvas ſure had ſuch a notable one upon ſalt-petre. And I remember, that formerly making ſome Experiments about the differing manners of Diſſolution of the ſame Concrete by ſeveral Liquors, I found, that Oyl of Vitriol diſſolves Sea-ſalt in a very odd way, (vvhich you vvill find mention'd among my promiſcuous Experiments,) vvherefore pouring, upon a ſolution of Bay-ſalt, made in but a moderate proportion of Water, Oyl of Vitriol to the full Weight of the dry Salt, and abſtracting the Liquor in a Glaſs Cucurbite plac'd in Sand, I obtain'd, without ſtreſs of fire, beſides flegme, good ſtore of a Liquor, vvhich, by the Smel and Taſt, ſeem'd to be ſpirit of Salt. And to ſatisfie my ſelf the better, mingling a little of it vvith ſome of the ſpirit of Nitre lately mention'd, I found the mixture, even without the Aſſiſtance of Heat, to diſſolve crude Gold. And having, for further Tryals ſake, pour'd ſome of it upon ſpirit of fermented Urine, till the Affuſion ceaſ'd to produce any Conflict, and having afterwards gently evaporated away the ſuperfluous moiſture, there did, as I expected, ſhoot, in the remaining Liquor, a Salt figur'd like Combs and Feathers, thereby diſcloſing it ſelf to be much of the nature of Sal Armoniack, ſuch as I elſewhere relate my having made, by mingling ſpirit of Urine vvith ſpirit of common Salt, made the ordinary way.]

This (*Pyrophilus*) is all I can find at preſent of that Account, of vvhich I hop'd to have found much more; but you will be the more unconcern'd, for my not adding divers other things, that, I remember, I try'd, as vvell before and after the vvriting the above-tranſſcrib'd Paper, (as particularly, that *I* found the Experiment ſometimes to ſucceed not ill, when *I* diſtill'd the Oyl of Vitriol and Sea-ſalt together, without the intervention of Water, (whereby much time was ſav'd,) and alſo when *I* imploy'd Oyl of Sulphur, made with a Glaſs Bell, in ſtead of Oyl of Vitriol,) if *I* inform You, that afterwards *I* found, that *Glauber* himſelf, in ſome of his ſubſequent pieces, had deliver'd more intelligibly the Way of making what he, without altogether ſo great a Brag, as moſt think, calls his *Sal mirabilis*, (which yet ſome very ingenious Readers of his Writings have come to Us to teach them,) and that thoſe Experiments of his about it, which *I* vvas able to make ſucceed, (for ſome *I* was not, and ſome *I* did not think fit to try) you will find, together with thoſe of my Own, in more proper places of other Papers. Onely, to apply what hath been above related to my preſent purpoſe, *I* muſt not here pretermit a couple of Obſervations.

And firſt we may take notice of the power, that Mixtures, though they ſeem but very ſlight, & conſiſt of the ſmalleſt number of ingredients, may, if they make great changes of Texture, have, in altering the Nature and Qualities of the compounding Bodies. For in our (above recited) caſe, though Sea-ſalt be a Body conſiderably fix'd, requires a naked Fire to be elevated even by the help of copious additaments of beaten Bricks, or Clay, &c. to keep it from Fuſion, yet the ſaline Corpuſcles are diſtill'd over in a moderate Fire of Sand, whilſt the Oyl of Vitriol, by whoſe intervention they acquire this volatility, though it be not (like the other) a Groſſe or (as the ſame Chymiſt ſpeaks) corporeal ſalt, but a Liquor, that has been already diſtill'd, is yet, by the ſame operation, ſo fix'd, as to ſtay behind, not onely in the Retort, but, as I have ſometimes purpoſely try'd , in much conſiderabler heats then That needs in this Experiment be expoſ'd to. Nor onely is the oyl of Vitriol made thus far fix'd , but it is otherwiſe alſo no leſs chang'd. For when the remaining Salt has been expoſ'd to a competent heat, that it may be very drie and white, to be ſure of which, I ſeveral times do, when the Diſtillation is ended , keep the remaining Maſſe (taken out of the Retort and beaten) in a Crucible among quick coals, you ſhall have a conſiderable quantity (perhaps near as much as the Sea-ſalt You firſt imploy'd) of a Subſtance, which, though not inſipid, has not at all the taſt of Sea-ſalt, or any other pungent one, and much leſſe the highly corroſive acidity of Oyl of Vitriol.

And the mention of this ſubſtance leads me to the ſecond particular I intended to take notice of, which is a *Phænomenon* to confirme what I formerly intimated, That notwithſtanding the regular and exquiſite figures of ſome Salts, they may, by the addition of other Bodies, be brought to conſtitute Chryſtals of very differing, and yet of curious, ſhapes. For if You diſſolve the hitherto mention'd *Caput mortuum* of Sea ſalt (after You have made it very dry, and freed it from all pungency of Taſt) in a ſufficient quantity of fair water, and, having filtrated the ſolution, ſuffer the diſſolv'd Body leiſurely to coagulate, You will probably obtain, as I have often done, Chryſtals of a far greater Tranſparency, then the Cubes wherein Sea ſalt is wont to ſhoot, and of a ſhape far differing from theirs, though oftentimes no leſſe Curious then that of thoſe Cubes; and, which makes mainely for my preſent purpoſe, I have often obſerv'd thoſe finely figur'd Chryſtals to differ as much in ſhape from one another, as from the Graines of common Salt. And indeed *I* muſt not, on this occaſion, conceal from You, that whether it be to be imputed to the peculiar Nature of Sea ſalt, or (which I judge much more probable) to the great diſparities to be met with in Liquors, that do all of them paſs for Oyl of Vitriol, whether (I ſay) it be to this, or to ſome other cauſe, that the Effect is to be imputed, I have found my Attempts, to make the beſt ſort of *Sal mirabilis*, ſubject to ſo much incertainty, that though I have divers times ſucceeded in them, I have found ſo little Uniformity in the ſucceſs, as made me reckon this Experiment amongſt Contingent ones, and almoſt weary of medling with it.

Experiment VII. *

I Remember (*Pyrophilus*) I once made an Experiment, which, if I had had the Opportunity to repeat, and had done ſo with the like ſucceſs, I ſhould be tempted to look upon it, though not as a Lucriferous Experiment, (for tis the quite contrary,) yet as ſo Luciferous a one, as, how much ſoever it may ſerve to recommend Chymiſtry it ſelf, may no leſſe diſpleaſe Envious Chymiſts, who will be troubled, both that one, who admits not their Principles, ſhould deviſe ſuch a thing, and that having found it, he ſhould not (Chymiſt like) keep it ſecret.

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* Though this VII. Experiment, being conſiderable and very pertinent, the Author thought fit to mention it, ſuch as it is here delivered, when he writ but to a private friend; yet, after he was induc'd to publiſh theſe Papers, twas the (now raging) Plague, which drove him from the Accommodations requiſite to his purpoſe, that fruſtrated the Deſigne he had of firſt repeating that part of the Experiment, which treats of the Deſtruction of Gold: for as for that part, which teaches the Volatilization of it, he had tryed That often enough before.

But to give you a plain and naked Account of this matter, that you may be able the better to judge of it, and, if You pleaſe, to repeat it, I will freely tell You, That ſuppoſing all Metals, as well as other Bodies, to be made of one Catholick Matter common to them all, and to differ but in the ſhape, ſize, motion or reſt, and texture of the ſmall parts they conſiſt of, from which Affections of Matter, the Qualities, that difference particular Bodies, reſult, I could not ſee any impoſſibility in the Nature of the Thing, that one kind of Metal ſhould be tranſmuted into another; (that being in effect no more, then that one Parcel of the Univerſal Matter, wherein all Bodies agree, may have a Texture produc'd in it, like the Texture of ſome other Parcel of the Matter common to them both.)

And having firſt ſuppoſ'd this, I further conſider'd, That in a certain Menſtruum, which, according to the vulgar Chymiſts doctrine, muſt be a worthleſs Liquor, according to my apprehenſion there muſt be an extraordinary efficacy in reference to Gold, not onely to diſſolve, and otherwiſe alter it, but to injure the very Texture of that ſuppoſedly immutable Metal.

The Menſtruum then I choſe to try whether I could not diſſolve Gold with, is made by pouring on the rectifi'd oyl of the Butter of Antimony as much ſtrong ſpirit of Nitre, as would ſerve to præcipitate out of it all the *Bezoarticum Minerale*, and then with a good ſmart Fire diſtilling off all the Liquor, that would come over, and (if need be) Cohobating it upon the Antimonial powder. For though divers Chymiſts, that make this Liquor, throw it away, upon Preſumption, that, becauſe of the Ebullition, that is made by the Affuſion of the ſpirit to the Oyl, and the conſequent precipitation of a copious Powder, the Liquors have mutually deſtroy'd or diſarm'd each other; yet my Notions and Experience of the Nature of ſome ſuch Mixtures invites me to prize this, and give it the name of *Menſtruum peracutum.*

Having then provided a ſufficient quantity of this Liquor, (for I have obſerv'd that Gold ordinarily requires a far more copious Solvent then Silver,) we took a quantity of the beſt Gold we could get, and melted it with 3 or 4 times its weight of Copper, which Metal we chooſe rather then that which is more uſual among the Refiners, Silver, that there may be the leſſe ſuſpicion, that there remain'd any Silver with the Gold, after their ſeparation; this Mixture we put into good *Aqua fortis*, or ſpirit of Nitre, that all the Copper being diſſolv'd, the Gold might be left pure and finely powder'd at the bottom;

this Operation with *Aqua fortis* being accounted the beſt way of refining Gold that is yet known, and not ſubject, like Lead, to leave any Silver with it, ſince the *Aqua fortis* takes up that Metal. And for greater ſecurity, we gave the Powder to an Ancient Chymiſt, to boile ſome more of the Menſtruum upon it, without communicating to him our Deſign. This highly refin'd Gold being, by a competent degree of heat, brought, as is uſual, to its Native Colour and Luſtre, we put to it a large Proportion of the *Menſtruum peracutum*, (to which we have ſometimes found cauſe to adde a little ſpirit of Salt, to promote the Solution,) wherein it diſſolves ſlowly and quietly enough; and there remain'd at the bottom of the Glaſſe a pretty quantity (in ſhew, though not in weight) of white Powder, that the Menſtruum would not touch, and, if I much miſremember not, we found it as indiſſoluble in *Aqua*

Regis too. The Solution of Gold being abſtracted, and the Gold again reduc'd into a Body, did, upon a ſecond Solution, yield more of the white Powder, but not (if I remember aright) ſo much as at the firſt; now having ſome little quantity of this Powder, twas eaſie with Borax or ſome other convenient Flux, to melt it down into a Metal, which Metal we found to be white like Silver, and yielding to the Hammer, if not to a leſs preſſure, and ſome of it, being diſſolv'd in *Aqua fortis* or ſpirit of Nitre, did, by the odious Bitterneſs it produc'd, ſufficiently confirm us in our Expectation, to find it true Silver.

I doubt not, but you will demand (*Pyrophilus*) why I did not make other Tryals with this Factitious Metal, to ſee in how many other Qualities I could verifie it to be Silver, but the quantity I recover'd after Fuſion was ſo ſmall, ſome of it perhaps being left either in the Flux, or in the Crucible, that I had not wherewithall to make many Tryals, and being well enough ſatisfied by the viſible Properties, and the Taſt peculiar to Silver, both that it was a Metal, and rather Silver then any other, I was willing to keep the reſt of it for a while, as a Rarity, before I made further Tryals with it; but was ſo unfortunate, as with it to looſe it in a little Silver Box, where I had ſomething of more Value, and poſſibly of more Curioſity.

You will alſo ask, why I repeated not the Experiment? to which I ſhall anſwer, that, beſides that one may eaſily enough faile in making the Menſtruum fit for my purpoſe, I did, when I had another Opportunity, (for I was long without it,) make a Second Attempt; and having, according to the above mention'd Method, brought it ſo far, that there remain'd nothing but the melting of the White Powder into Silver, when having waſh'd it, I had layd it upon a piece of white Paper by the fires ſide to dry, being ſuddenly call'd out of my Chamber, an ignorant Maid, that in the mean time came to dreſs it up, unluckily ſwept this Paper, as a foul one, into the fire: which Diſcouragement, together with multiplicity of Occaſions, have made me ſuſpend the Purſuit of this Experiment, till another Opportunity. But in the mean time I was confirm'd in ſome part of my Conjecture by theſe Things.

The firſt, by finding, that with ſome other Menſtruums which I try'd, and even with good *Aqua Regis* it ſelf, I could obtain from the very beſt Gold, I diſſolv'd in them, ſome little quantity of ſuch a White Powder, as I was ſpeaking of; but in ſo very ſmall a proportion to the diſſolv'd Gold, that I had never enough of it at once, to think it worth proſecuting Tryals with.

The other was this. That a very Experienc'd Mineraliſt, whom I had acquainted with part of what I had done, aſſur'd me, that an eminently Learned and Judicious perſon, that he nam'd to me, had, by diſſolving Gold in a certain kind of *Aqua Regis*, and after by reduction of it into a Body, rediſſolving it again, and repeating this Operation very often, reduc'd a very great, if not much the greater, part of an Ounce of Gold into ſuch a White Powder.

And the Third thing, that confirm'd me, was, the Proof given me by ſome Tryals that I purpoſely made; That the *Menſtruum peracutum* I imploy'd, had a notable Operation upon Gold, and would perform ſome things (one of which we ſhall by and by mention,) which Judicious Men, that play the great Criticks in Chymiſtry, do not think feaſible: ſo that there ſeems no greater cauſe to doubt, that the above mention'd Silver was really obtain'd out of the pure Gold, then onely this, That Men have hitherto ſo often in vain attempted to make a real Tranſmutation of Metals, (for the better or for the worſe,) and to deſtroy the moſt fix'd and compacted Body of Gold, that the one is look'd upon as an Unpracticable Thing, and the other as an Indeſtructible Metal.

To reflect then a little upon what we have been relating, if we did not miſtake nor impoſe upon our ſelves, (I ſay, upon our Selves, the Project being our own, and purſued without acquainting any body with our Aime,) it may afford us very conſiderable Conſequences of great moment.

And in the Firſt place, it ſeems probably reducible from hence, that however the Chymiſts are wont to talke irrationally enough of what they call *Tinctura Auri*, and *Anima Auri*; yet, in a ſober ſenſe, *ſome ſuch thing* may be admitted, I ſay, *ſome ſuch thing*, becauſe as on the one hand, I would not countenance their wild Fancies about theſe matters, ſome of them being as unintelligible, as the Peripateticks ſubſtantial Forms, ſo, on the other hand, I would not readily deny, but that there may be ſome more noble and ſubtle Corpuſcles, being duely conjoyn'd with the reſt of the Matter, whereof Gold conſiſts, may qualifie that Matter to look Yellow, to reſiſt *Aqua fortis*, and to exhibit thoſe other peculiar *Phænomena*, that diſcriminate Gold from Silver, and yet theſe Noble parts may either have their Texture deſtroy'd by a very piercing Menſtruum, or by a greater congruity with its Corpuſcles, then with thoſe of the remaining part of the Gold, may ſtick more cloſer to the former, and by their means be extricated and drawn away from the latter. As when (to explain my meaning by a groſs Example) the Corpuſcles of Sulphur and Mercury do, by a ſtrict Coalition, aſſociate themſelves into the Body we call Vermilion, though theſe will riſe together in Sublimatory Veſſels, without being divorc'd by the fire, and will act, in many caſes, as one Phyſical Body: yet tis known enough among Chymiſts, That if You exquiſitely mix with it a due proportion of Salt of Tartar, the parts of the *Alkaly* will aſſociate themſelves more ſtrictly with thoſe of the Sulphur, then theſe were before aſſociated with thoſe of the Mercury, whereby You ſhall obtain out of the Cinnabar, which ſeem'd intenſely red, a real Mercury, that will look like fluid Silver. And this Example prompts me to mind You, (*Pyrophilus*) That, at the beginning of this Paragraph, I ſaid no more, then that the Conſequence, I have been deducing, might probably be inferr'd from the Premiſes. For as tis not abſurd to think, that our Menſtruum may have a particular Operation upon ſome Noble, and (if I may ſo call them) ſome Tinging parts of the Gold, ſo it is not impoſſible, but that the Yellowiſhneſs of that rich Metal may proceed not from any particular Corpuſcles of that Colour, but from the Texture of the Metal; as in our lately mention'd Example, the Cinnabar was highly Red, though the Mercury, it conſiſted of, were Silver-coloured, and the Sulphur but a pale Yellow; and conſequently, the Whiteneſs, and other Changes, produc'd in the new Metal we obtain'd, may be attributed not to the Extraction of any tinging Particles, but to a Change of Texture, whereon the Colour, as well as other Properties of the Gold did depend. But That, which made me unwilling to reject the way, I firſt propoſed, of explicating this Change of Colour, was, That a Mineraliſt of great Veracity hath ſeveral times aſſur'd me, that a known Perſon in the Relators Country, the Netherlands, got a great deal of Money by the way of Extracting a Blew Tincture out of Copper, ſo as to leave the Body White; adding, that he himſelf, having procur'd from a friend (to ſatisfie his Curioſity) a little of the Menſtruum, (whoſe chiefe Ingredients his friend communicated to him, and he to me,) he did, as he was directed, diſſolve Copper in common *Aqua fortis*, to reduce it into ſmall parts, and then having kept the *Calx* of the Powder of this Copper for ſome hours in this Menſtruum, he perceiv'd, that the clear Liquor, which was weak in Taſt, did not diſſolve the Body of the Metal, but onely extract a blew Tincture, leaving behind a very White Powder, which he quickly reduc'd by Fuſion into a Metal of the ſame Colour, which he found as Malleable as before. Which I the leſſe wonder at, because the Experienc'd Chymiſt *Johannes Agricola*, in his Dutch Annotations upon *Poppius*, mentions the making of a White and Malleable Copper in good quantities upon his own knowledge; and that of ſuch a kind of Copper, I have with pleaſure made

Tryal, I elſewhere relate. But of theſe matters we may poſſibly ſay more in a convenient place.

The Second thing, that ſeems deducible from our former Narrative, is, That however moſt (for I ſay not all) of the Judicionſeſt among the Chymiſts themſelves, as well as among their Adverſaries, believe Gold too fix'd and permanent a Body to be changeable by Art, inſomuch that tis a receiv'd Axiom amongſt many Eminent Spagyriſts, that *facilius eſt aurum conſtruere, quàm deſtruere*; yet Gold it ſelf is not abſolutely indeſtructible by Art, ſince Gold being acknowledg'd to be an Homogeneous Metal, a part of it was, by our Experiment, really chang'd into a Body, that was either true Silver, or at leaſt a new kind of Metal very differing from Gold. And ſince tis generally confeſs'd, that among all the Bodies we are allow'd to obſerve near enough, and to try our skill upon, there is not any, whoſe Form is more ſtrictly united to its Matter then that of Gold; and ſince alſo the Operation, by which the White Powder was produc'd, was made onely by a corroſive Liquor, without violence of Fire, it ſeems at leaſt a very probable Inference, That there is not any Body of ſo conſtant and durable a Nature, but that, notwithſtanding its perſiſting inviolated in the midſt of divers ſenſible Diſguiſes, its Texture, and conſequently its Nature may be really deſtroy'd, in caſe this more powerful and appropriated Agent be brought by a due manner of Application to work upon the Body, whoſe Texture is to be deſtroy'd.

But this Matter we elſewhere handle, and therefore ſhall now proceed to the Laſt and chief Conſectaries of our Experiment.

Thirdly then, it ſeems deducible from what we have deliver'd, that there may be a real Tranſmutation of one Metal into another, even among the perfecteſt and nobleſt Metals, and that effected by Factitious Agents in a ſhort time, and, if I may ſo ſpeak, after a Mechanical manner. I ſpeak not here of Projection, whereby one part of an Aurifick Powder is ſaid to turn I know not how many 100 or 1000 parts of an ignobler Metal into Silver or Gold, not onely becauſe, though Projection includes Tranſmutation, yet Tranſmutation is not all one with Projection, but far eaſier then it: but chiefly becauſe tis not in this Diſcourſe you are to expect what I can ſay, and do think, concerning what Men call the Philoſophers Stone. To reſtrain my ſelf then to the Experiment we are conſidering, that ſeems to teach us, that, at leaſt among inanimate Bodies, the nobleſt and conſtanteſt ſort of Forms are but peculiar Contrivances of the Matter, and may, by Agents, that work but Mechanically, that is, by locally moving the parts, and changing their Sizes, Shape, or Texture, be generated and deſtroy'd; ſince we ſee, that in the ſame parcel of Metalline Matter, which a little before was true and pure Gold, by having ſome few of its parts withdrawn, and the reſt tranſpoſ'd, or otherwiſe alter'd in their ſtructure, (for there appears no token, that the Menſtruum added any thing to the Matter of the produc'd Silver,) or by both theſe wayes together, the Form of Gold, or that peculiar Modification which made it Yellow, indiſſoluble in *Aqua fortis*, &c. is aboliſh'd, and from the new Texture of the ſame Matter, there ariſes that new Forme, or Convention of Accidents, from which we call a Metal Silver; and ſince Ours was not onely diſſoluble in *Aqua fortis*, but exhibited that exceſſively bitter Taſt, which is peculiar to Silver, there ſeems no neceſſity to think, that there needs a diſtinct Agent, or a particular Action of a Subſtantial Form, to produce in a Natural Body the moſt peculiar and diſcriminating

ting Properties: For twas but the ſame Menſtruum, devoid of Bitterneſs, that, by deſtroying the Texture of Gold, chang'd it into another, upon whoſe account it acquir'd at once both Whiteneſs in colour, Diſſolubleneſſe in *Aqua fortis*, and aptneſſe to compoſe a bitter Body with it, and I know not how many other new Qualities are attributed.

I know tis obvious to object, that t'is no very thrifty way of Tranſmutation, inſtead of Exalting Silver to the condition of Gold, to degrade Gold to the condition of Silver. But a Tranſmutation is nevertheleſſe more or leſſe real, for being or not being Lucriferous, and ſince That may inrich a Brain, that may impoveriſh a Purſe, I muſt look upon your humour as that of an Alchymiſt, rather then of a Philoſopher, if I durſt not expect that the Inſtructiveneſs in ſuch an Experiment will ſuffice to recommend it to You. And if I could have ſatisfied my ſelf, that good Authors are not miſtaken about what they affirm of the Tranſmutation of Iron into Copper, though, the Charge and Pains conſider'd, it be a matter of no Gain, yet I ſhould have thought it an Experiment of great Worth, as well as the Tranſmutation of Silver into Gold. For tis no ſmall matter to remove the Bounds, that Nature ſeems very induſtriouſly to have ſet to the Alterations of Bodies; eſpecially among thoſe Durable and almoſt Immortal Kinds, in whoſe Conſtancy to their firſt Forms, Nature ſeems to have deſign'd the ſhewing her ſelf invincible by Art.

I ſhould here (*Pyrophilus*) conclude what I have to ſay of the Experiment, that hath already ſo long entertain'd us, by recommending to You the repetition of what I had not the Opportunity to try above once from end to end, were it not, that I remember ſomething I ſaid about the *Menſtruum peracutum*, may ſeem to import a Promiſe of communicating to

You ſomething of the Efficacy of that Liquor upon Gold. And therefore partly for that reaſon, and partly to make ſure, that the preſent Diſcourſe ſhall not be uninſtructive to You, I would adde, That though not onely the generality of Refiners and Mineraliſts, but divers of the moſt Judicious Cultivators of Chymiſtry it ſelf, hold Gold to be ſo fix'd a Body, that it can as little be Volatiliz'd as Deſtroy'd, and that upon This ground, that the proceſſes of ſubliming or diſtilling Gold to be met with in divers Chymical Books, are either myſtical, or unpracticable, or fallacious, (in which Opinion I think them not much miſtaken;) though This, I ſay, be the perſwaſion even of ſome critical Chymiſts, yet, upon the juſt Expectation I had to find my Menſtruum very operative upon Gold, I attempted and found a way to Elevate it to a conſiderable height, but a far leſs proportion of Additament, then one that were not fully perſwaded of the poſſibility of Elevating Gold; and though I have indeed found, by two or three ſeveral Liquors, (eſpecially the *Aqua pugilum*, ænigmatically deſcrib'd by *Baſilius*,) that the Fixedneſs of Gold is not altogether invincible, yet *I* found the Effect of theſe much inferior to that of our Mixture, touching which *I* ſhall relate to You the eaſieſt and ſhorteſt, though not perhaps the very beſt, manner of imploying it.

We take then the fineſt Gold we can procure, and having either Granulated it, or Laminated it, we diſſolve it in a moderate heat, with a ſufficient quantity of the *Menſtruum peracutum*, and having carefully decanted the Solution into a conveniently ſiz'd Retort, we very gently in a Sand-Furnace diſtill off the *Menſtruum*, and if we have a mind to elevate the more Gold, we either pour back upon the remaining ſubſtance the ſame Menſtruum, or, which is better,

ter, rediſſolve it with freſh; the Liquor being abſtracted, we urge the remaining Matter by degrees of Fire, and in no ſtronger a one, then what may eaſily be given in a Sand Furnace, a conſiderable quantity of the Gold will be Elevated to the upper part of the Retort, and either fall down in a Golden colour'd Liquor into the Receiver, or, which is more uſual, faſten it ſelf to the Top and Neck in the form of a Yellow or Reddiſh Sublimate, and ſometimes we have had the Neck of the Retort inrich'd with good ſtore of large thin Chryſtals, not Yellow but Red, and moſt like Rubies, very glorious to behold; (though even theſe being taken out, and ſuffer'd to lie a due time in the open Air would looſe their ſaline Form, and run *per Deliquium* into a Liquor.) Nor ſee I any cauſe to doubt, but that by the Reaffuſions of freſh Menſtruum upon the dry *Calx* of Gold, that ſtayes behind, the whole Body of the Metal may be eaſily enough made to paſs through the Retort, though, for a certain reaſon, I forbore to proſecute the Experiment ſo far.

But here (*Pyrophilus*) I think my ſelf oblig'd to interpoſe a Caution, as well as to give you a further Information about our preſent Experiment. For firſt I muſt tell You, that though even Learned Chymiſts think it a ſufficient proof of a true Tincture, that not onely the colour of the Concrete will not be ſeparated by Diſtillation, but the extracting Liquor will paſs over tincted into the Receiver; yet this ſuppoſition, though it be not unworthy of able men, may, in ſome caſes, deceive them. And next I muſt tell You, that whereas *I* ſcruple not, in ſeveral Writings of mine, to teach, That the Particles of ſolid and conſiſtent Bodies are not alwaies unfit to help to make up Fluid ones, *I* ſhall now venture to ſay further, That even a Liquor, made by Diſtillation, how volatile ſoever ſuch Liquors may be thought, may in part conſiſt of Corpuſcles of the moſt compact and ponderous Bodies in the World.

Now to manifeſt Both theſe things, and to ſhew You withall the Truth of what I elſewhere teach, *That ſome Bodies are of ſo durable a Texture, that their Minute parts will retain their own Nature, notwithſtanding variety of Diſguizes, which may impoſe, not onely upon other men, but upon Chymiſts themſelves;* I will adde, that to proſecute the Experiment, I dropp'd into the Yellow Liquor afforded me by the Elevated Gold, a convenient quantity of clean running Mercury, which was immediately colour'd with a Golden colour'd Filme, and ſhaking it to and fro, till the Menſtruum would guild no more, when I ſuppoſ'd the Gold to be all præcipitated upon the Mercury, I decanted the clarifi'd Liquor, and mixing the remaining *Amalgam* (if I may ſo call it) of

Gold

Gold and Mercury, with ſeveral times its Weight of Borax, I did, as I expected, by melting them in a ſmall Crucible, eaſily recover the ſcatter'd Particles of the Elevated Metal, reduc'd into one little Maſs or Bead of Corporal or Yellow (though perhaps ſomewhat paliſh) Gold. But yet whether the Gold, that tinged the Menſtruum, might not, before the Metal was reduc'd or præcipitated out of it, have been more ſucceſsfully apply'd to ſome conſiderable purpoſes, then a bare Solution of Gold, that hath never been Elevated, may be a Queſtion, which I muſt not in this place determine, and ſome other things that I have try'd about our Elevated Gold, I have elſewhere taken notice of; Onely this further Uſe I ſhall here make of this Experiment, that, whereas *I* ſpeak in other Papers, as if there may be a volatile Gold in ſome Oars, and other Minerals, where the Mine-men do not find any thing of that Metal, *I* mention ſuch a thing upon the Account of the paſt Experiment and ſome Analogies. And therefore as *I* would not be underſtood to adopt what every Chymical Writer is pleaſ'd to fancie concerning Volatile Gold; ſo *I* think Judicious men, that are not ſo well acquainted with Chymical Operations, are ſometimes too forward to condemn the Chymiſts Obſervations; not becauſe their Opinions have nothing of Truth, but becauſe they have had the ill Luck not to be warily enough propoſ'd. And to give an inſtance in the Opinion, that ſome Minerals have a Volatile Gold, (and the like may be ſaid of Silver,) *I* think I may give an Account, rational enough, of my admitting ſuch a thing, by explicating it thus: That *as* in our Fxperiment, though after the almoſt total abſtraction of the Menſtruum, the remaining Body being true Gold, and conſequently, in its own Nature, fix'd, yet it is ſo ſtrictly aſſociated with ſome volatile ſaline Particles, that theſe, being preſs'd by the fire, carry up along with them the Corpuſcles of the Gold, which may be reduc'd into a Maſs by the admiſtion of Borax, or ſome other Body fitted to divorce the Corpuſcles of the Metal from thoſe, that would Elevate them, and to unite them into Grains, too big and ponderous to be ſublim'd; *ſo* in ſome Mineral Bodies there may be pretty ſtore of Corpuſcles of Gold, ſo minute, and ſo blended with the unfix'd Particles, that they will be carried up together with them by ſo vehement a heat, as is wont to be imploy'd to bring Oars, and even Metalline maſſes to Fuſion. And yet tis not impoſſible, but that theſe Corpuſcles of Gold, that in ordinary Fuſions fly away, may be detain'd and recover'd by ſome ſuch proper *additament*, as may *either* work upon, and (to uſe a Chymical Term) mortifie the other parts of the Maſs, without doing ſo upon the Gold; *or* by aſſociating with the Volatile and ignobler Minerals, ſome way or other diſable them to carry away the Gold with them, as they otherwiſe may do; *or* by its Fixedneſs and Cognation of Nature make the diſperſ'd Gold imbody with it. On which Occaſion I remember, that a very Ingenious Man, deſiring my Thoughts upon an Experiment, which he and ſome others, that were preſent at it, look'd upon as very ſtrange, namely, that ſome good Gold, having, for a certain Tryal, been cuppell'd with a great deal of Lead, inſtead of being advanc'd in Colour, as in Goodneſs, was grown manifeſtly paler then before; my Conjecture being, That ſo great a Proportion of Lead might contain divers particles of volatile Silver, which, meeting with the fix'd Body of the Gold, by incorporating therewith, was detain'd, was much confirm'd by finding, upon Enquiry, that the Gold, inſtead of looſing its Weight, had it conſiderably increaſ'd; which did much better anſwer my Gheſs, then it did their Expectation, that made the Experiment, and were much ſurpriz'd at the Event. But this is no fit place to proſecute the conſideration of the Additaments, that may be uſ'd to unite and fix the Particles of the nobler Metals, blended with volatile Bodies; though perhaps what hath been ſaid may afford ſome Hint about the matter, as well as ſome Apology for the Chymical Term, Volatile Gold: the poſſibility of which, I preſume, we have evinc'd by the latter part of this Experiment, (in which I am ſorry I cannot remember the proportion of the remaining Salts, that were able to Elevate the Gold;) for That I have ſeveral times made, and therefore dare much more confidently rely on it, then I can preſs You to do on the former part, (about the Tranſmutation, or at leaſt Deſtruction of Gold,) till You or I ſhall have Opportunity to repeat that Tryal.

Experiment VIII.

THough (*Pyrophilus*) the Experiment, I am about to ſubjoin, may, at the firſt glance, ſeem onely to concern the *production of Taſts*, and be indeed one of the principal, that I deviſ'd concerning that ſubject, and that belongs to the Notes I have made about thoſe Qualities: yet if You do not of your ſelf take notice of it, I may hereafter have Occaſion to ſhew You, that there are ſome particulars in this Experiment, that are applicable to more then Taſts. And ſince I had once thoughts (however ſince diſcouraged by the difficulties of the Attempt) to make my *Notes* extend even to *divers Qualities*, which the *operations of Chymiſts*, and the *practice of Phyſicians* have made men take notice of; (ſuch as the powers of *corroding, præcipitating, fixing, purging, bliſtering, ſtupifying*, &c.) I preſume You will not diſlike, that one, who had thoughts to ſay ſomething even of Chymical and of Medical Qualities, if I may ſo call them, ſhould give You here an Experiment or two about more obvious, though *particular*, Affections of Bodies, when there are ſeveral things in the Experiment, that may be of a *general import* to the Doctrine of the Origine of Qualities and Forms.

We took then an Ounce of refined Silver, and having diſſolv'd it in *Aqua fortis*, wee ſuffer'd it to ſhoot into Chryſtals, which being dried, we found to exceed the weight of the Silver by ſeveral Drachms, which accrued upon the concoagulation of the acid Salts, that had diſſolv'd, and were united to the Metal. Theſe Chryſtals we put into a Retort, and diſtill'd them in Sand, with almoſt as great a heat as we could give in a hammer'd Iron Furnace, wherein the Operation was made; but there came over onely a very little ſowriſh Flegm with an ill ſent, wherefore the ſame Retort being ſuffer'd to cool, and then coated, it was remov'd to another Furnace, capable of giving a far higher degree of Heat, namely, that of a naked fire, and in this Furnace the Diſtillation was purſued by the ſeveral degrees of heat, till at length the Retort came to be red hot, and kept ſo for a good while; but though even by this Operation there was very little driven over, yet That ſufficiently manifeſted what we aimed at, ſhewing (namely) that a Body extreamly Bitter might afford, as well as it conſiſted of, good ſtore of parts that are not at all bitter, but (which is a very differing taſt) eminently Sowr. For our Receiver being taken off even when it was cold, the contain'd ſpirit ſmoak'd out like rectify'd *Aqua fortis*, and not onely ſmelt and taſted like *Aqua fortis*, to the Annoyance of the Noſe and Tongue, but being pour'd upon Filings of crude Copper, it fell immediately to corrode them with violence, making much hiſſing, and ſending up thick fumes, and in a trice produc'd, with the corroded Copper, a blewiſh colour, like That, which that Metal is wont to give in good *Aqua fortis*.

Afterwards we took *Minium* and *Aqua fortis*, and made a Solution, which being filtred and evaporated, left us a *Saccharum Saturni*, much like the common made with ſpirit of Vinegar, then taking this ſweet Vitriol of Lead, (as we elſewhere call it) we endeavour'd in the formerly mention'd Sand Furnace to drive it over in a Retort; but finding That degree of fire incompetent to force over any thing ſave a little flegmatick Liquor, we cauſ'd the Retort to be coated, and transferr'd to the other Furnace, where being urg'd with a naked Fire, it afforded at length a ſpirit ſomewhat more copious then the Silver had done. This Spirit ſmoak'd in the cold Receiver as the other had, and did, like it, rankly ſmell of *Aqua fortis*, and was ſo far from retaining any of the ſweetneſs of the Concrete that had yielded it; that it was offenſively acid, and being pour'd upon *Minium*, it did with noiſe and Bubbles fall upon it, and quickly afforded us a Liquor, which being filtred, did, by its Sweetneſs as well as other proofs, aſſure us, that there would have needed but a gentle Evaporation (if We had leiſure to make it) to obtain from it a true Sugar of Lead; and tis remarkable, that the Concrete, which appear'd White before Diſtillation, remain'd, for the moſt part, behind in the Retort in the form of a black *Caput mortuum*, (ſometimes We have had it in a Yellowiſh Lump,) which was neither at all ſweet, as the Vitriol of Lead it ſelf had eminently been, nor at all ſowr, as the Liquor, diſtill'd from it, was in a high degree, but ſeem'd rather inſipid, and was indeed but a *Calx* of Lead, which the heat of the fire had in part reduc'd into true and manifeſt Lead in the Retort it ſelf, as appear'd by many Grains of ſeveral Sizes, that We met with in the *Caput mortuum*, (the reſt of which is eaſily enough reducible by fuſion with a convenient flux into malleable Lead it ſelf.)

There are ſome *Phænomena* of this Experiment, that We may elſewhere have Occaſion to take notice of; as particularly, That, notwithſtanding Silver be a Body ſo fix'd in the fire, that it will (as tis generally known) endure the Cuppel it ſelf, and though in the dry'd Chryſtals of Silver, the Salt, that adheres to the Silver, increaſes the weight of the Metal but about a 4th or a 3d part; yet this ſmall proportion of ſaline Corpuſcles was able to carry up ſo much of that almoſt fixedſt of Bodies, that, more then once, We have had the inſide of the Retort, to a great height, ſo cover'd over with the Metalline Corpuſcles, that the Glaſs ſeem'd to be Silver'd over, and could hardly, by long ſcraping, be freed from the copious and cloſely adhering Sublimate.

But the *Phænomenon*, that I chiefly deſire to take notice of at preſent, is this, That not onely *Aqua fortis*, being concoagulated with differing Bodies, may produce very differing Concretes, but the ſame numerical Saline Corpuſcles, that, being aſſociated with thoſe of one Metal, had already produc'd a Body eminent in one Taſt, may afterwards, being freed from that Body, compoſe a Liquor eminent for a very differing Taſt; and after That too, being combin'd with the particles of another Metal, would with them conſtitute a Body of a very eminent Taſt, as oppoſite as any one can be to both the other Taſts; and yet theſe Saline Corpuſcles, if, inſtead of this ſecond Metal, they ſhould be aſſociated with ſuch a one as That, they are driven from, would therewith exhibit agen the firſt of the three mention'd Taſts. To prove all this, We took Chryſtals of refined Silver made with *Aqua fortis*, and though theſe Chryſtals be, as We often note, ſuperlatively bitter; yet having, by a naked fire, extorted from them what Spirit we could, and found That, as we expected, extremely Acid, we put one part of it upon a few Filings of Silver, of which it readily made a Solution more bitter then Gall, and the other part of the diſtill'd Liquor We poured upon *Minium*: and though, whilſt it had been an Ingredient of the Chryſtals of Silver committed to Diſtillation, it did with that Metal compoſe an exceſſively bitter ſubſtance, yet the ſame Particles, being looſned from that Metal, and aſſociated with thoſe of the Lead, did with them conſtitute a Solution, which by Evaporation afforded us a *Saccharum Saturni*, or a Vitriol ſweet as Sugar. And for further confirmation, We varied the Experiment, having, in a naked Fire, diſtilled ſome dry'd *Saccharum Saturni* made with *Aqua fortis*, the little Liquor that came over, in proportion to the Body, that afforded it, was ſo ſtrong a ſpirit of Nitre, that for ſeveral hours the Receiver was fill'd with red Fumes; and though the ſmoaking Liquor were hugely ſharp, yet part of it, being pour'd upon a piece of its own *Caput mortuum*, (in vvhich We perceiv'd not any Taſt) did at length (for it vvrought but very ſlowly) exhibit ſome little Grains of a Saccharine Vitriol, but the other part, being put upon Filings of Silver, fell upon it immediately vvith noiſe and ſtore of ſmoak, and a vvhile after concoagulated vvith part of it (vvhich it had diſſolv'd) into a Salt exceſſively bitter.

Experiment IX.

THe Artificial Tranſmutation of Bodies, being as the rareſt and difficulteſt Production, ſo one of the nobleſt and uſefulleſt Effects of Humane skill and power, not onely the clear Inſtances of it are to be diligently ſought for and priz'd, but even the Probabilities of effecting ſuch an extraordinary Change of Bodies are not to be neglected; eſpecially, if the Verſion, hop'd for, be to be made betwixt Bodies of Primordial Textures, (if I may ſo call them,) and ſuch Bodies, as by the greatneſſe of their Bulk, and by their being to be found in moſt of the mix'd Bodies here below, make a conſiderable part of thoſe, that we Men have the moſt immediately to do with. Invited by theſe conſiderations, *Pyrophilus*, I ſhall venture to give you the *Account* of ſome Obſervations, and Tryals, about the Tranſmuting of Water into Earth, though it be not ſo perfect as I Wiſh, and as I Hope, by Gods bleſſing, to make it.

The firſt Occaſion, afforded me to do any thing about this matter, was my being conſulted by a Gentleman, (an antient Chymiſt, but not at all a Philoſopher,) who relating to me how much he had (with the wonted ſucceſs of ſuch Attempts) labour'd after the Grand *Arcana*, complain'd to me among other things, that, having Occaſion to imploy great quantity of purifi'd Rain-water, he obtain'd from it much *leſs* then he wiſh'd of the ſubſtance that he look'd for, but a *great deal* of a certain whitiſh excrementitious Matter, which he knew not what to make of. This gave me the Curioſity firſt to deſire a ſight of it, in caſe he had not thrown it away, (which by good fortune he had not,) and then, taking notice of the unexpected plenty, and ſome of the Qualities of it, to ask him ſome Queſtions which were requiſite and ſufficient to perſwade me, that this Reſidenee came not from accidental foulneſs of the Water, nor of the Veſſels twas receiv'd in. This I afterwards often thought of, and indeed it might juſtly enough awaken ſome ſuſpicions, that the little Motes, that have been ſometimes obſerv'd to appear numerous enough, in pure Rain water whilſt it is diſtilling, might not be meerly accidental, but really produc'd, as well as exhibited by the action of the Fire. I thought it then worth while to proſecute this matter a little farther: And having put a pretty quantity of diſtill'd Rainwater in a clean Glaſs Body, and fitted it with a Head and a Receiver, I ſuffer'd it to ſtand in a Digeſtive Furnace, till, by the gentle heat thereof, the Water was totally abſtracted, and the Veſſel left dry: which being taken out of the Sand, I found the bottom of the Glaſs all cover'd over with a white (but not ſo very white) ſubſtance; which, being ſcrap'd off vvith a Knife, appear'd to be a fine Earth, in vvhich I perceiv'd no manifeſt Taſt, and vvhich, in a vvord, by ſeveral Qualities ſeem'd to be Earth.

This incourag'd me to rediſtill the Rain-water in the ſame Glaſs Body, vvhoſe Bottom, vvhen the Water vvas all drawn off, afforded me more of the like Earth: but though the Repetition of the Experiment, and my having, for greater caution, try'd it all the while in a new Glaſs, that had not been imploy'd before to other uſes, confirm'd me much in my conjecture, That unleſs it could be prov'd, which I think will ſcarce be pretended, that ſo inſipid a Liquor as Rain-water ſhould, in ſo gentle a heat, diſſolve the moſt cloſe and almoſt Indeſtructible Body of Glaſs it ſelf, (which ſuch corroſive Menſtruums as *Aqua fortis*, and *Aqua Regis* are wont to leave unharm'd,) the Earthy powder, I obtain'd from already diſtill'd Rain water, might be a Tranſmutation of ſome parts of the Water into that ſubſtance, yet having unhappily loſt part of my Powder, and conſum'd almoſt all the reſt, (for I kept a little by me, which you may yet ſee,) I ſhould, till I had more frequently reiterated my Experiments, (which then I had not Opportunity to do, do, though I had thoughts of doing it alſo with Snow-water, that I had put into Chymical Glaſſes for that purpoſe, and with liquor of melted Hail, which I had likewiſe provided.) and thereby alſo obtain'd ſome more of this Virgin Earth (as divers Chymiſts would call it) to make farther Tryals with, have retain'd greater ſuſpicions, if I had not afterwards accidentally fall'n into diſcourſe of this matter with a learned Phyſician, vvho had dealt much in Rain-vvater, but he much confirmed me in my conjecture, by aſſuring me, that he had frequently found ſuch a White Earth, as I mention'd, in diſtill'd Rain Water, after he had diſtill'd the ſame Numerical Liquor (carefully gather'd at firſt) I know not how many times one after another, adding, that he did not find (any more then I had done) any cauſe to ſuſpect, that if he had continu'd to rediſtill the ſame portion of Water, it would have yielded him more Earth.

But the Odneſs of the Experiment ſtill keeping me in ſuſpence, it was not without much delight, that afterwards mentioning it to a very Ingenious Perſon, whom, without his leave, I think not fit to name, well verſ'd in Chymical matters, and whom I ſuſpected to have, in order to ſome Medicines, long wrought upon Rain vvater, he readily gave me ſuch an Account of his proceedings, as ſeem'd to leave little ſcruple about the Tranſmutation we have been mentioning: for he ſolemnly affirm'd to me, that having obſerv'd, as I had done, that Rain-vvater would, even after a Diſtillation or two, afford a Terreſtrial ſubſtance, which may ſometimes be ſeen ſwimming up and down in the Limpid Liquor, he had the Curioſity, being ſettled and at leiſure, to try how long he could obtain this ſubſtance from the Water. And accordingly having freed Rain Water, carefully collected, from its accidental, and as it vvere fæculent

Earthineſs, vvhich it vvill depoſite at the firſt ſlovv Diſtillation, (and vvhich is oftentimes colour'd, vvhereby it may be diſtinguiſh'd from the White Earth made by Tranſmutation,) he rediſtill'd it in very clean Glaſses, not onely 8 or 10 times, but neer 200, vvithout finding that his Liquor grevv weary of affording him the White Earth, but rather that the Corpuſcles of it did appear far more numerous, or at leaſt more conſpicuous in the latter Diſtillation, then in the former. And vvhen I expreſſed my Curioſity to ſee this Earth, he readily ſhevv'd me a pretty quantity of it, and preſented me vvith ſome, vvhich comparing vvith vvhat I had remaining of mine, I found to be exceeding like it, ſave that it vvas more purely White, as having been, for the main, afforded by Rain Water, that had been more frequently rectify'd. And to compare this welcome Powder with That I made my ſelf, I try'd with This divers things, which I had before try'd with my own, and (becauſe the quantity preſented me was leſs inconſiderable) ſome others too. For I obſerv'd in this new Powder, as I had done with my Own, that being put into an excellent Microſcope, and plac'd where the Sun beams might fall upon it, it appear'd a White Meal, or heap of Corpuſcles ſo exceeding, not to ſay unimaginably, ſmall, that, in two or three choice Microſcopes, both I and others had occaſion to admire it; and their extreme Littleneſs was much more ſenſibly diſcern'd, by mingling ſome few Grains of Sand amongſt them, which made a Mixture that look'd like that of Pibble ſtones, and of the fineſt Flower. For our Earth, even in the Microſcope, appear'd to conſiſt of as ſmall Particles, as the fineſt Hair-powder to the naked Eye. Nor could We diſcern this Duſt to be tranſparent, though, when the Sun ſhin'd upon it, it appear'd in the Microſcope to have ſome Particles a little gliſtering, which yet, appearing but in a glaring light, we were not ſure to be no *deceptio viſûs*. 2. I found, that our White Powder, being caſt into Water, would indeed for a while diſcolour it by ſomewhat Whitening it, which is no more then Spaud will do, and the fine duſt of white Marble, and other ſtones, whoſe Corpuſcles, by reaſon of their Minuteneſs, ſwimme eaſily for a while in the Water, but when it was once ſetled at the bottom, it continu'd there undiſſolv'd(for ought I could perceive) for ſome dayes and nights, as Earth would have done. 3. Having weigh'd a quantity of it, and put it into a new clean Crucible, with another inverted over it for a Cover, I plac'd it among quick Coals, and there kept the Crucible red hot for a pretty while, cauſing the Fire afterward to be acuated with a blaſt of a Bellows, but taking out the Powder, I neither found it melted, nor clotted into lumps, nor, when I weigh'd it again, did I ſee cauſe to conclude that there was much of it waſted, beſides what ſtuck to the ſides of the Crucible, and to a little Clay, vvherewith I had luted on the Cover, and which (to ſhew you, that the Heat had not been inconſiderable) was in ſeveral places burnt red by the vehemence of the fire; and when *I* afterwards kept this Powder in an open Crucible among glowing coals, neither I, nor one that *I* imploy'd to aſſiſt me, perceiv'd it all to ſmoak; and having put a little upon a quick Coal, and blown That too, *I* found that which *I* had not blown away, to remain fix'd (which ſome Bodies will not do) upon quick Coals, that will endure the fire in a red hot Crucible. 4. *I* found this powder to be much heavier *in ſpecie* then VVater. For imploying a nice pair of Gold Scales, and a Method that would be too long here to deſcribe, *I* found that this Powder weigh'd ſomevvhat (though not much) more then twice ſo much common VVater,as vvas equal to it in Bulk. And leaſt ſome Corollaries, that ſeem obviouſly contain'd in the common, but groundleſs, conceipts of the Peripateticks, about the Proportions of the Elements in Denſity &c. ſhould make you expect,that this povvder ought to have been much more ponderous, *I* ſhall adde, that having had the Curioſity, vvhich *I* wonder no body ſhould have before me,to examine the Gravity of the Earth, which ſeems the moſt Elementary of any we have, I took ſome ſifted Wood-aſhes, which I had cauſ'd to be three or four times boyl'd in a plentiful proportion of Water, to free them from Salt, and having put them very dry into common Water, I found them but little heavier then our newly mention'd Powder, ſurpaſſing in weight Water of the ſame Bulk but twice, and a little more then a 6th part, (Water and It being very little more then as 1 to $2\frac{1}{6}$.) And that you may the leſs doubt of this, I will yet ſubjoyn, that, examining the Specifick Gravity of (white) Glaſs it ſelf, I found that compact Body to be very little, if at all more then 2 times and a half as heavy as Water of equal Bigneſs to it. So that the Gravity of that Powder, which, borrowing a Chymical term, we have been calling Virgin-Earth, being added to its Fixtneſs, and other Qualities, it may ſeem no great impropriety of Speech to name it Earth, at leaſt, if by Earth we mean not the pure Elementary Earth of the Schools, which many of themſelves confeſſe not to be found actually ſeparate, but a Body dry, cold, ponderous, induring the fire, and, which is the main, irreſoluble by Water and Fire into other Bodies ſpecifically different.

(But to return to the Guiſe of the Powder, when I ask'd this Learned man, whether he obſerv'd the Glaſs he diſtill'd in to have been fretted by the Liquor, and whether This loſt of its Subſtance, according as it depoſited more Powder, He anſwer'd me, (and he is a Perſon of unſuſpected Credit,) that he found not his Glaſs to have been injur'd by the Liquor, and that the Water waſted (though he were carefull it ſhould not do ſo by Evaporation and Tranſfuſions) by degrees ſo much, that there remain'd, by his æſtimate, but about an 8th part of the firſt quantity: and though, for certain reaſons, he kept by him the Liquor laſt diſtill'd, yet he doubted not, but that it might be very nigh totally brought into Earth, ſince out of an Ounce of diſtill'd Rain-water he had already obtain'd near 3 quarters of an Ounce, if not more, of the often mention'd Earth.]

Theſe ſeveral Relations will, *I* ſuppoſe, perſwade You, *Pyrophilus*, that this Experiment is hopeful enough to be well worth your purſuing, if not that perhaps none but ſuch a ſcrupulous Perſon as I, would think the proſecution of it other then ſuperfluous. And if You do acquieſce in what hath been already done, you will, I preſume, think it no mean confirmation of the Corpuſcularian Principles, and *Hypotheſes*. For if, contrary to the Opinion that is ſo much in requeſt among the generality of modern Phyſicians and other Learned Men, that the Elements themſelves are tranſmuted into one another, and thoſe ſimple and Primitive Bodies, which Nature is preſum'd to have intended to be the ſtable and permanent ingredients of the Bodies ſhe compounds here below, may be artificially deſtroy'd, and (without the intervention of a Seminal and Plaſtick power) generated or produc'd: if, *I* ſay, this may be done, and that by ſuch ſlight means, why may We not think, that the Changes and Metamorphoſes, that happen in other Bodies, which are acknowledg'd by the Moderns to be far more lyable to Alterations, may proceed from the Local Motion of the minute or inſenſible parts of Matter, and the Changes of Texture that may be conſequent thereunto? Some bold Atomiſts would here be determining, by what particular Wayes this ſtrange Tranſmutation of Water into Earth may be perform'd, and would perchance particularly tell you, how the continually, but ſlowly, agitated parts of the Water, by their innumerable occurſions, may by degrees rub, and as it were grind themſelves into ſuch Surfaces, as *either* to ſtick very cloſe to one another by immediate contact, (as *I* elſewhere obſerve poliſh'd pieces of Glaſs to do,) *or* implicate, and intangle themſelves together ſo, as to make, as it were, little *knots*; which knots (he would add,) or the newly mention'd *cluſters* of coherent Particles, being then grown too great and heavy to be ſupported by the Water, muſt ſubſide to the bottom in the form of a Powder, which, by reaſon of the ſame Gravity of theſe *Moleculæ*, and the ſtrict Union of the leſſer particles that compoſe them, obtain an *indiſpoſition to diſſolve in water*, and to be *elevated or diſſipated by the fire*; as their *Inſipidneſs* may be accounted for by its being but the ſame with that of the Liquor, whence they were made, and their *Tranſparency* by that of the Water they were made of, and by the multitude of the little Surfaces that belong to ſo fine a Powder. But though in favour of ſuch conjectures, I could ſomewhat illuſtrate them, *partly* by applying to this Occaſion what I elſewhere obſerve of the reducing of the fluid Body of Quickſilver by a bare Circulation, (which is but a repeated Diſtillation) with a proportionable heat, into a real Powder, vvhich alſo vvill not ſo eaſily be raiſ'd by the fire, as the fluid Body, vvhence by change of Texture it was made; and *partly* by ſubjoining, among other things, how by the conjunction of two diſtill'd Liquors digeſted together, I have obtain'd good ſtore of an inſipid Subſtance, that would not diſſolve in Water, and that would long enough indure no inconſiderable degree of Fire; though, I ſay, by theſe and other ſuch particulars, I could make our Atomiſts conjectures leſſe improbable, yet the full diſquiſition of ſo difficult a Subject is too long and intricate to be proper for this place. *

And therefore, without here examining our Atomiſts explication of this *Metamorphoſis*, we will give him leave for a vvhile to ſuppoſe the Tranſmutation it ſelf to be real, and thereupon to conſider, whether the Hiſtorical part of it do not much diſfavour ſome of the chief Doctrines of the Chymiſts, and a fundamental one of *Helmonts*. For if the pureſt Water may be turn'd into Earth, it will not be eaſie to make it improbable, that the other Ingredients of mixt Bodies, which the Chymiſts call their Hypoſtatical Principles, are capable of being tranſmuted into one another, which would overthrow one of the main Foundations of their whole Philoſophy; and beſides, if out of the ſimpleſt Water it ſelf, a moderate fire can produce a large proportion of Earth, that was not formally præexiſtent in it, how ſhall We be ſure, that in all the *Analyſes*, which the Fire makes of mixt Bodies, the Subſtances thereby exhibited are obtain'd by Separation onely, without any Tranſmutation? As for *Helmont*, tis well enough known, that he makes Water to be the Material Principle of all Bodies here below, which he vvould have to be either Water it ſelf, or but Water diſguiſ'd by thoſe Forms, vvhich the Seeds of things have given it. I will not here examine, whether this Opinion, if he had reſtrain'd it to Animals and Vegetables, might not, with ſome reſtriction and explanations, be kept from appearing abſurd, ſince my *Eleutherius* hath (though without abſolutely adopting it) elſewhere pleaded for its not being ſo extravagant, as it hath been thought.

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*What is here delivered may be, for the main, verify'd by what the Reader will meet with in the (following) Xth. Experiment, though That be not It which the Author meant.

But whereas *Helmont*'s Grand Argument from Experience is grounded on this, That the Alkaheſt doth, as he affirms, by being digeſted with, and diſtill'd from other tangible Bodies, reduce them all at laſt into a Liquor, no way differing from Rain Water, though we ſhould grant the matter of fact, yet the Experiment of our Powder will warrant me to queſtion their Ratiocination. For if all mix'd Bodies be therefore concluded to be materially from Water, becauſe they are, by the Operation of the Fire, and a Menſtruum, after having paſs'd through divers prævious

Changes, reduc'd at length into inſipid Water; by the ſame way of arguing(and with greater cogency) I might conclude, that all thoſe Bodies are materially but diſguiſ'd Earth, ſince without intervention of a Seminal Principle, (for *Helmont* will not allow that Title to Fire, which he ſtiles the Artificial Death of Things) Water it ſelf may be turn'd into Earth. Indeed if that acute Chymiſt were now alive, and had ſuch an immortal Liquor,as he deſcribes his *Alkaheſt* to be,I would gladly put him upon trying whether that Menſtruum would reduce our White Earth into Water. But there being no more probability of that, then that ſuch reproduc'd Water, being juſt what it vvas before,might be turn'd into Earth again; it may be probably ſaid, that ſince theſe Bodies are mutually convertible into one another, (and,as to the verſion of Water into Earth, by a ſeemingly ſlight Operation,) they are not either of them ingenerable and incorruptible Elements, much leſs the ſole matter of all tangible Bodies, but onely two of the Primordial, and of the moſt obvious Schematiſms of that, which is indeed the univerſal Matter, vvhich, as it comes to have its minute Particles aſſociated after this or that manner, may, by a change of their Texture and Motion, conſtitute, with the ſame Corpuſcles, ſometimes Water, and ſometimes Earth.

But (*Pyrophilus*) to leave theſe Reflexions, to return to the bold Conjectures that they are grounded on; though if I had leiſure and indulgence enough, I could, I confeſs, add many things in favour of ſome of thoſe Thoughts:* yet I would not have you wonder, that, whilſt I vvas mentioning the many particulars, that ſeem to evince the change of Water into Earth, I ſhould let fall ſome Words, that intimate a Diffidence about it. For, to diſguize nothing unto You, I muſt confeſs, that having, in ſpight of an unuſual care, unluckily loſt a whole paper of the Powder I had made my ſelf, and having unexpectedly been oblig'd to remove from my Furnaces, before I had made half the Tryals I judg'd requiſite in ſo nice a caſe, I have not yet laid aſide all my Scruples.

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* Of the poſſible wayes of turning Liquors into conſiſtent Bodies, by bending, breaking, twiſting, and by otherwiſe changing the Texture of the Liquor, ſee more particularly the *Hiſtory of Fluidity and Firmneſſe*, publiſhd by the Author.

For 1. I would gladly know, whether the untranſmuted Rain water, by the depoſition of ſo much Terreſtrial Matter, were grown lighter *in ſpecie* then before, or ſharp in taſt. Next, I would be throughly ſatisfied, (which I confeſs I am not yet, notwithſtanding all that the followers of *Angelus Sala* have confidently enough written,) whether and hovv far inſipid Liquors (as Rain Water is) may, or may not vvork as Menſtruums upon Stones or Earthy Bodies: not to queſtion, vvhether the Particles of Rain Water may not, by their mutual Attrition, or ſome other action upon one another, be reduc'd into Shapes and Sizes fit to compoſe ſuch a Menſtruum, as the Liquor was not before; as in divers Plants, that ſeem to be nouriſh'd onely with Water, the Sap is endow'd with a ſharp Taſt, and great penetrancy, and activity of parts.

2. It were alſo fit to know, whether the Glaſs Body, wherein all the Diſtillations are made, do looſe of its VVeight any thing neer ſo much, as the obtained Powder amounts to, over and above the Decrement of VVeight, which may be imputed to the action of the Heat upon the ſubſtance of the Glaſs, in caſe it appear by another Glaſs, kept empty in an equal heat, and for the ſame time that the Glaſs looſes by ſuch Operations any thing worth reckoning. And it vvere alſo not impertinent to try, whether

the Gravity of the obtain'd Powder be the ſame *in ſpecie* with that of the Glaſs; vvherein the Diſtillations were made: (for that it *differ'd but about a* 5^th^ *part* from the weight of Chryſtalline Glaſs I lately mention'd.) Which Scruple, and ſome of the former, I might have prevented, if I had had convenient Metalline Veſſels, wherein to make the Diſtillations inſtead of Glaſs ones.

3. I could wiſh likewiſe that it were more demonſtrably determin'd, what is on all hands taken for granted, (as it appears indeed highly probable,) that diſtill'd Rain Water is a perfectly Homogeneous Body, vvhich if it be not, divers ſuſpicions might be ſuggeſted about its Tranſmutation into Earth, and if it be, 'twill be as a very ſtrange thing, ſo a matter of very great difficulty to conceive, hovv a perfectly and exquiſitely Homogeneous Matter ſhould, without any Addition, or any Seminal and Plaſtick Principle, be brought to

afford great ſtore of a Matter of much more Specifick Gravity then it ſelf, ſince we ſee, that no Aggregate we can make of Bodies but æquiponderant *in ſpecie* with water, doth, by vertue of their Convention, grow ſpecifically heavier then it.

4. Having had the Curioſity to try, whether Corroſive Liquors would work upon our white Powder, I found, that not onely good Oyl of Vitriol would corrode it, but ſtrong and deflegm'd Spirit of Salt did readily work upon part of it, and that without the aſſiſtance of heat, though not without hiſſing, and exciting great ſtore of bubbles, as I have known ſuch Menſtruums do, when put upon *Lapis Stellaris*, or *Oſſifragus*, or ſome ſuch ſoft Stone; as if that ſo much defæcated Rain-water, actuated by heat, had reſolv'd ſome of the looſer Corpuſcles of the Sand or Stone, that, together with ſome Salts, compoſe common Glaſs, as I have obſerv'd

ſerv'd in ſome Petrifying VVater, that ſome of the Bodies I took up, and which were preſum'd to be petrify'd, were but cruſted over with Stone, that ſeem'd generated but by the ſucceſſive appoſition of Stony Particles, that, lying inviſibly mingled with the running VVater, ſtuck in their paſſage to the conveniently diſpoſ'd Bodies that lay in the Streams way. But yet I muſt not omit, that, when I ſuffer'd this Mixture to ſettle, as much of the Powder, as ſeem'd to be a very great part of it, remain'd in the lower part of the Liquor, as if that had rather fretted then diſſolv'd it, and that not becauſe the Menſtruum was overcharg'd or glutted, as I found by putting in afterwards ſeveral freſh parcels of Powder, which it readily fell upon, not without noiſe and froth. Nor muſt I forget, that ſometimes I have excited ſuch an Ebullition, by powring the ſame Liquors upon the Earthy part of Wood-aſhes, ſeveral times waſh'd in boyling water, (though, I confeſs, I afterwards ſomewhat ſuſpected there might remain ſome little adhering *Alkaly*, which might occaſion thoſe Bubbles, notwithſtanding that both I and another, whom I alſo invited to taſt it, took the Earth to be quite Saltleſſe.) I might (*Pyrophilus*) adde, that ſometimes alſo me thought I found this Powder (which yet likewiſe ſometimes hapned to me with the lately mention'd Earth of Wood-aſhes) ſomewhat gritty between my Teeth, and ſubjoin divers other particulars, if it were not too tedious to mention to You all the doubts and conſiderations that have occurr'd to me about the recited Change of Water into Earth: which yet are not ſuch as ought to hinder me from giving You the Hiſtorical account *I* have ſet down, ſince to ſome of my Scruples *I* could here give plauſible Anſwers, but that *I* cannot do it in few words. And if any part of our white Powder prove to be true Earth, no body perhaps yet knows to what the Experiment may lead ſagacious Men: and whether in a ſtrict ſenſe it be true Earth or no, yet the *Phænomena*, that are exhibited in the production of it, are ſufficient to give this 9th Experiment a place among the others (of the ſame Decad) with which tis aſſociated. For ſince out of a ſubſtance that is univerſally acknowledg'd to be Elementary and Homogeneous, and which manifeſtly is fluid, tranſparent, much lighter *in ſpecie* then Earth, moiſt and fugitive, there is artificially generated or obtain'd a Subſtance conſiſtent, vvhite, and conſequently opacous, comparatively ponderous, dry, and not at all fugitive; the Alteration is ſo great, and effected in ſo ſimple a way, that it cannot but afford us a conſiderable Inſtance of what the varied Texture of the minute parts may perform in a Matter confeſſedly ſimilar. And if frequently diſtill'd Rain Water ſhould not be allow'd Homogeneous, our Experiment will at leaſt ſhew us, better then perhaps any hath yet done, how little we are bound to believe what the Chymiſts, and others tell us, when they pretend manifeſtly to exhibit to us Homogeneous Principles, and Elementary Bodies, and how difficult it is to be certain when a Body is abſolutely irreſoluble into ſpecifically differing ſubſtances, and conſequently what is the determinate number of the perfectly ſimple Ingredients of Bodies: (ſuppoſing *that* ſuch there are.) Though I muſt confeſs, that my onely aime is not to Relate what hath been done, but to Procure the proſecution of it. For if the obtain'd Subſtance be, by the Rain Water, diſſolv'd out of the Glaſſe, this will both prove a noble and ſurprizing Inſtance of what may be done by inſipid Menſtruums, even upon Bodies that are juſtly reckon'd among the compacteſt and moſt indiſſoluble that we know of, and may afford us many other conſiderable hints, that have been partly intimated already: and if on the other ſide, this Powder, whether it be true Elementary Earth or not, be found to be really produc'd out of the Water it ſelf,it may prove a *Magnale* in Nature,and of greater conſequence then will be preſently foreſeen, and may make the Alchymiſts hopes of turning other Metals into Gold,appear leſs wild,ſince that by Experimentally evincing,that two ſuch difficult Qualities to be introduc'd into a Body,as conſiderable degrees of Fixity & Weight,(whoſe requiſiteneſſe to the making of Gold are two of the Principal things, that have kept me from eaſily expecting to find the Attempts of Alchymiſts ſucceſſeful,) may, without the mixture of a Homogeneous Matter, be generated in it, by varying the Texture of its parts.

I will not now adventure to adde any thing of what I have been attempting about the tranſmuting (without additaments) of pure Alkalizate Salts into Earth, becauſe I do not yet know, whether the Tryals will anſwer my Hopes: (for I do not yet call them my Expectations.) But upon this ſubject of Tranſmutations, I could, if it did not properly belong to another Treatiſe, tell you ſomething about the Changes, that may be wrought upon highly rectify'd Spirit of Wine, vvhich vvould perchance make You think of other things of the like kind leſſe infeaſible. For vvhereas tis a known thing, that That ſpirituous Liquor being kindled, (and that, if you pleaſe, by other Spirit of Wine actually fir'd) will, for ought appears, burn all away, that is, be totally turn'd into flame; if *I* durſt rely, in ſo important a caſe, on a couple of Tryals, whilſt I hope for an Opportunity of making farther ones, I would tell You, that by a way unthought on (that *I* know of) by any Body, I have, without vvithout any addition, obtain'd, from ſuch Spirit of Wine, as, being kindled in a Spoon, would flame all away, without leaving the leaſt drop behind it, a conſiderable quantity of downright incombuſtible Flegm. And by another way (mention'd indeed by *Helmont*, but not taught to almoſt any of his Readers) ſome Ingenious Perſons, that you know and eſteem, vvorking by my directions, (but vvithout knowing vvhat each other vvas doing) did both of them reduce conſiderable quantities of high rectify'd Spirit of Wine (that vvould before have burnt all away) into a Liquor, that was for the moſt part flegm, as I vvas inform'd as well by my own taſt, as by the Tryals I order'd to be made: (being forc'd my ſelf to be moſt commonly abſent.) From which change of the greateſt part of that at firſt liquid Spirit into Flegm, it ſeems deducible, that the ſame portion of Matter, vvhich, by being kindled, may be turn'd all into

Fire, may be, by another vvay of handling, turn'd into Flegm or Water, and this vvithout the addition of any thing, and vvithout being vvrought upon by any viſible Body, but one ſo extremely dry as duely prepar'd Salt of Tartar; and that it ſelf is not ſo indiſpenſably neceſſary to the obtaining of flegm out of totally inflammable Spirit of Wine, but that, as I was ſaying, I did, by another way, obtain that dull Liquor vvithout imploying the Salt, or any other viſible Body vvhatſoever. But I make a ſcruple to entertain you any longer with Extravagances of this Nature, and yet, if I were ſure You vvould contain your ſmiles, I would adde for concluſion, That, if I had had time and Opportunity to furniſh my ſelf with any quantity of that Water, I had it in my thoughts to try, vvhether that vvould have afforded me ſuch a Terreſtrial ſubſtance, as Rain Water had done, and thereby have undergone a new aud further *Metamorphoſis.*

The X. Experiment.

THere is one Experiment more, two of the chief *Phænomena* of vvhich belong to another Diſcourſe; (vvhere I particularly mention Them,) and yet I ſhall conclude this little Treatiſe vvith the recitation of the Experiment it ſelf, not onely becauſe divers of the *Phænomena* do eminently belong to our preſent ſubject, but becauſe I have ſcarce met vvith any Experiments more ſuitable to the Deſign I have of ſhevving, before I conclude this Diſcourſe, vvhat great and ſudden Productions and Deſtructions of Qualities may be effected by the compoſition of the ſmalleſt Number of Ingredients, even among Liquors themſelves, and ſuch too as are believ'd to be both of Them ſimple and Homogeneous, and incapable of Putrefaction, that ſo it may appear, what notable Alterations of Qualities even ſeemingly ſlight and eaſie mixtures can perform among Bodies, both of them fluid, as well as among thoſe that were either both of them ſtable, or one of them ſtable, and the other conſiſtent.

Take then of good Oyl of Vitriol, and of Spirit of Wine, that will burn all away, equal parts, not in quantity, but in Weight; put them together by little and little, and having plac'd the Mixture in a Bolt-head, or Glaſs Egg with a long neck, and carefully ſtopp'd it with a Cork and hard Wax, ſet the Veſſel in a moderate heat to digeſt for a competent while; (two or three weeks may do well,) then pour out the Mixture into a tall Glaſs Cucurbite, to which lute on a Head and a Receiver with extraordinary care, to prevent the Avolation of the Spirits, which will be very ſubtle: then with a very gentle fire abſtract the ſpirit of Wine, that will firſt aſcend, and when the Drops begin to come over ſowriſh, ſhift the Receiver, and continue the Diſtillation with great care, that the Matter boyl not over,and when you judge that about half the acid Liquor is come over, it will not be amiſs, though it be not neceſſary, to change the Receiver once more; but whether you do this or no, your Diſtillation muſt be continued, increaſing the fire towards the latter end, till you have brought over all you can, and what remains in the bottom of the Cucurbite muſt be put into a Glaſs well ſtopp'd, to keep it from the Air.

NB. 1. That to the Production of moſt, if not of all the *Phænomena* of this Experiment,it is not abſolutely neceſſary,that ſo long a Digeſtion,(not to ſay, not any;)be premiſ'd; though if the time above preſcrib'd be allow'd, the Experiment will ſucceed the better.

2. That,I remember,I have ſometimes made uſe of Oyl of Sulphur *per Campanam*(as they call it) inſtead of Oyl of Vi-

Vitriol, to produce the recited *Phænomena*; and though the Attempt ſucceeded not ill, as to divers particulars, yet I afterwards choſe rather to imploy oyl of Vitriol, both becauſe it did, in ſome points, better anſwer my Expectation then the other Liquor, and becauſe I would not give occaſion to ſuſpect, that the Odours, hereafter to be mention'd as *Phænomena* of our Experiment, were due to the common Sulphur, whence the unctuous Liquor, made *per Campanam*, was obtain'd, as ſuch, and did no way proceed from the acid Vitriolate Salt, which that Oyl (as tis improperly call'd) doth abound with.

3. That I had likewiſe the Curioſity to digeſt Oyl of Vitriol with Spaniſh Wine, inſtead of Spirit of Wine, by which means I obtain'd an odd Spirit, and reſidence, and ſome other *Phænomena*, which I content my ſelf to have in this place given hint of, in regard that Wine being a Liquor of a much leſs ſimple nature then its Spirit,

the *Phænomena*, afforded me by This, are much fitter for my preſent purpoſe.

4. That great care muſt be had in regulating the fire, when once a good part of the Acid ſpirit, mention'd in the proceſs, is come over. For if the Fire be not increaſ'd, the reſt will ſcarce aſcend, and if it be increaſ'd but a little too much, the Matter will be more apt, then one would ſuſpect, to ſwell exceedingly in the Cucurbite, and perhaps run over into the Receiver, and ſpoil what it finds there, as it hath more then once hapned to me, when I was fain to commit the management of the Fire to others.

Now the oyl of Vitriol, and the ſpirit of Wine, being both of them diſtill'd Liquors, and the Latter of them ſeveral times rediſtill'd, and one of them being drawn from ſo ſimple and familiar a ſubſtance as Wine, and the other from a Concrete not more compounded, then what Nature her ſelf (which, as I elſewere ſhew, can, without the help of Art,

produce

produce Vitriol) doth divers times preſent us with; theſe Liquors, I ſay, being both or them diſtill'd, and conſequently volatile, one would expect, that by diſtilling them, they ſhould be brought over united, as I have tryed, that the ſpirit of Wine,and of Nitre, or alſo of common Salt may be; and as the ſpirits of differing Vegetables are wont to be; or that, at leaſt, the Diſtillation ſhould not much alter them , from what it found them, after they had been well mingled together. But this notwithſtanding, theſe two Liquors being of very odd Textures in reference to each other, their conjunction and diſtillation will make them exhibit divers conſiderable and perhaps ſurprizing *Phænomena*.

For Firſt, whereas ſpirit of Wine has no great Sent , nor no good one, and moderately deflegm'd Oyl of Vitriol is wont to be inodorous; the Spirit, that firſt comes over from our mixture, hath a Sent not onely very differing from ſpirit of Wine, but from all things elſe, that, I remember, I ever ſmelt. And as this new Odour doth to almoſt all thoſe, whoſe Opinions I have asked about it, ſeem very fragrant and pleaſant, ſo I have ſometimes had it ſo exceeding ſubtle, that, in ſpight of the care that was taken to lute the Glaſſes exactly together, it would perfume the neighbouring parts of the Laboratory, and would not afterwards be kept in by a cloſe Cork, cover'd with two or three ſeveral Bladders, but ſmell ſtrongly at ſome diſtance from the Viol wherein it was put, I did not think it unlikely, that ſo noble and piercing a Liquor might be of no mean efficacy in Phyſick; and though I miſs'd of receiving an account of its Effects from ſome ingenious Phyſicians, into whoſe Hands I put it to have Tryals made of it, yet I cannot deſpair of finding it a conſiderable Medicine, when I remember, partly what hath been done by ſome acquaintances of mine with bare flegme of Vitriol, upon the account (as is ſuppoſ'd) of that little Sulphur of Vitriol, that, though but ſparingly, doth inrich that Liquor; and partly, what the Maſters of Chymical *Arcana* tell us of the wonderful vertues of the Volatile Sulphur of Vitriol, and what I have obſerv'd my ſelf, that may invite me to have a good Opinion of Remedies of that nature.

2. But to ſhevv how much the Odours of Bodies depend upon their Texture, I ſhall now adde, That after this volatile and odoriferous Spirit is come over, and has been followed by an Acid Spirit, it will uſually, towards the latter end of the Diſtillation, be ſucceeded by a Liquor, that is not onely not fragrant, but ſtinks ſo ſtrongly of Brimſtone, that *I* have ſometimes known it almoſt take away the Breath (as they ſpeak) of thoſe, who, when I had the Receiver, newly taken off, in my hand,

did (either becauſe to make ſport I gave them no vvarning, or becauſe they would not take it, as thinking what *I* told them impoſſible,) too boldly adventure their Noſes in the Tryal.

3. There is in this Operation produc'd a Liquor, that will not mingle either with the fragrant, or with the fœtid Spirit hitherto deſcrib'd, but is very differing from both of them, and is ſo very pleaſant, ſubtle, and Aromatical, that it is no leſs differing as well from Spirit of Wine, as Oyl of Vitriol. But of this Liquor I give a further Account in a more convenient place.

4. When the Diſtillation is carried on far enough, You will find at the bottom, that the two above mention'd Diaphanous Spirits (for Oyl of Vitriol is indeed rather a Saline Spirit, then an Oyl) have produc'd a pretty Quantity of a Subſtance, not onely very opacous, but black almoſt like Pitch or Jet.

5. And this Subſtance, though pro-

duc'd by two Bodies, that were not onely fluid, but diſtill'd, will not alone be conſiſtent, but (if the Diſtillation have been urg'd far enough) brittle.

6. And though Spirit of Wine be reputed the moſt inflammable, and Oyl of Vitriol the moſt corroſive Liquor that is known, yet I could not find, that this black Subſtance would eaſily, if at all, be brought, I ſay not to flame, but to burn; nor that it had any diſcernible Taſt, though both the Liquors, from whoſe mixture it was obtain'd, have exceeding ſtrong and pungent Taſts.

7. And whereas both Oyl of Vitriol and Spirit of Wine will each of them more readily, then moſt Liquors that are yet known, mingle with common Water, and diffuſe it ſelf therein, I obſerv'd, that this pitchy Maſs, if the Diſtillation had been continued till it was perfectly dry, would not, that I could perceive, diſſolve in common water for very many hours, and, if I much miſre-

member not, for ſome dayes:

8. And Laſtly, whereas the Oyl of Vitriol, and the Spirit of Wine, were both of them diſtill'd Liquors, and one of them exceeding volatile and fugitive; yet the black Maſs, produc'd by them, was ſo far fix'd, that I could not make it riſe by a conſiderably ſtrong and laſting fire, that would have raiſ'd a much more ſluggiſh Body, then the heavieſt of thoſe that concurr'd to produce it.

The remaining particulars, that I have obſerv'd in this Experiment, belong to another Treatiſe, and therefore I ſhall forbear to mention them in this: nor ſhall I at preſent adde any new *Phænomena* to thoſe I have already recited; thoſe freſhly mention'd Experiments, and thoſe that preceded it, being, even without the aſſiſtance of the four Obſervations I have delivered before them, ſufficient to manifeſt the Truth I have been endeavouring to make out, For in the Experiments we are ſpeaking of, it cannot well be *pretended*, or at leaſt not well *prov'd*, that any Subſtantial Forms are the Cauſes of the Effects I have recited. For in moſt of the (above mention'd) caſes, beſides that, in the Bodies we imploy'd, the Seminal Vertues, if they had any before, may be ſuppoſ'd to have been deſtroy'd by the fire, they were ſuch, as thoſe I argue with would account to be *Factitious* Bodies, artificially produc'd by Chymical Operations. And tis not more manifeſt, that, in the production of theſe Effects, there intervenes a Local Motion, and change of Texture by theſe Operations, then tis inevident and precarious, that they are the Effects of ſuch things, as the Schools fancy Subſtantial Forms to be: ſince tis, in theſe new Experiments, by the Addition of ſome new particles of Matter, or the Receſs, or Expulſion of ſome præexiſtent ones, or, which is the moſt frequent way, by the Tranſpoſition of Minute parts, yet without quite excluding the other two, that no more skilful a Chymiſt then I have been able to produce by Art a not inconſiderable number of ſuch changes of Qualities; that more notable ones are not ordinarily preſented us by Nature, where ſhe is preſumed to work by the help of Subſtantial Forms; I ſee not, why it may not be thought probable, that the ſame Catholick and fertile Principles, *Motion, Bulk, Shape*, and *Texture* of the Minute parts of *Matter*, may, under the Guidance of Nature, (whoſe Laws the modern Peripateticks acknowledge to be eſtabliſh'd by the all-wiſe God,) ſuffice likewiſe to produce thoſe other Qualities of Natural Bodies, of which we have not given particular Inſtances.

BIBLIOTECA NAZ. VITTORIO EMANUELE

FINIS.

ERRATA.

Præf.p. 11.*l. ult. read* aime. *præf.p.*13.*l.*13.*r.* perhaps. *p.* 68.*l.* 13.*r.* deſtroyes. *p.* 130.*l.*14. *r.* Peare. *p.* 146.*l.* 20.*r.* Principle. *p.* 247. *l.* 25. *r.*Fleurs. *p.* 231.*l.* 15.*r.* it. *p.* 325.*l.* 6. *a Comma at* inflammable. *p.*337.*l.* 7.*r.* of. *p.* 411.*l.* 7.*r.* former.

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